

START SPECIFICATIONS

FOUNDATION

B-595-C-B210A

HANFORD WASTE VITRIFICATION PLANT

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE



FLUOR DANIEL
ADVANCED TECHNOLOGY DIVISION
CONTRACT 8457

DOE CONTRACT NO.
DE-AC06-86RL10838

9513336.1003

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

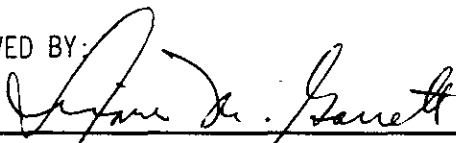
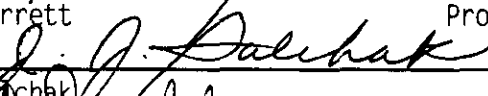
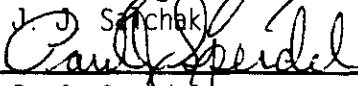
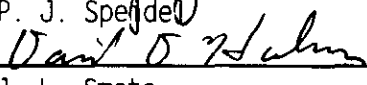

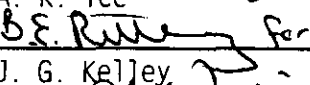

VITRIFICATION BUILDING FOUNDATION
SPECIFICATION B-595-C-B210A

APPROVED FOR CONSTRUCTION

Revision 2 PER CR-0972

Issue Date 7-14-93

APPROVED BY:

	
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<u>7-14-93</u>
Date
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Date
<u>7-14-93</u>
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Date

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U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

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Rev. 2

VITRIFICATION BUILDING FOUNDATION
B-595-C-B210A

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* Submitted as Reference Document

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SECTION 03200
CONCRETE REINFORCEMENT
B-595-C-B210A-03200

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>X</u>	II	<u> </u>
SAFETY CLASS	1	<u>X</u>	2	<u> </u>
			3	<u> </u>
			4	<u> </u>

ORIGINATOR:

CHECKER:

M. S. Whitten 7/13/93
M. S. Whitten, Structural Engineer Date

E. Jorgensen 7-13-93
E. Jorgensen, Structural Engineer Date

APPROVED BY:

M. S. Whitten
M. S. Whitten Lead Discipline Engineer

7/13/93
Date

JUL 15 1993

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

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SECTION 03200 CONCRETE REINFORCEMENT

This addendum modifies the Project Standard Specification Section by addition, deletion, and/or revision for the purpose of conveying the package specific requirements of the HWVP project. The type of modification shall be defined, and indicated in subsequent text, as follows:

- (Addition) - Indicates the following statement(s) is/are added to the referenced text.
- (Deletion) - Indicates the following statement(s) is/are deleted from the referenced text.
- (Revisions) - Indicates the following statement(s) is/are revision(s) to the referenced text.

PART 1 GENERAL

- 1.2 (Deletion) ASTM A185
- 1.6.1 (Revision) Delete "and welded wire fabric" in second line.

PART 2 PRODUCTS

- 2.1.1.2 (Deletion)
- 2.1.3.2 (Revision) Delete "including load bearing pad on bottom to prevent vapor barrier puncture."

PART 3 EXECUTION

- 3.2.1.3 (Deletion)
- 3.2.1.5 (Deletion)

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U.S. DEPARTMENT OF ENERGY
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DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
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SECTION 03200
CONCRETE REINFORCEMENT
B-595-STD-03200

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0929
ISSUE DATE _____

WAPA	YES	____	NO	<u>X</u>
QUALITY LEVEL	I	<u>X</u>	II	____
SAFETY CLASS	1	<u>X</u>	2	____
			3	____
			4	____

ORIGINATOR:

CHECKER:

M. S. Whitten 7/13/93
M. S. Whitten, Structural Engineer Date

E. Jorgensen 7-13-93
E. Jorgensen, Structural Engineer Date

APPROVED BY:

M. S. Whitten
M. S. Whitten Lead Discipline Engineer

7/13/93
Date

SECTION 03200
CONCRETE REINFORCEMENT
B-595-STD-03200

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**SECTION 03200
CONCRETE REINFORCEMENT**

PART 1 GENERAL

1.1 SUMMARY

This section covers the technical requirements for the furnishing, installation, and testing of reinforcing steel and mechanical connectors for cast-in-place concrete.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 1989 Specification for Structural
Concrete for Buildings

ACI SP-66 1988 ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A185 1990 Standard Specification for Steel
Welded Wire Fabric, Plain, for Concrete
Reinforcement

ASTM A370 1990 (Rev. A) Standard Test Methods and
Definitions for Mechanical Testing
of Steel Products

ASTM A615 1990 Standard Specification for Deformed
and Plain Billet-Steel Bars for Concrete
Reinforcement

ASTM A706 1990 Standard Specification for Low-Alloy
Steel Deformed Bars for Concrete
Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4 1979 Structural Welding Code-Reinforcing
Steel

1.3 RELATED REQUIREMENTS

(Not Used)

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1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Shop fabrication and placement drawings prepared in accordance with ACI SP-66.

These drawings shall indicate bar sizes, spacings, locations and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, supporting and spacing devices (especially, for top reinforcing in thick mats and slabs), as well as complete placing information such as the required concrete cover and the location of splices and construction joints.

1.6.2 Certified Material Test Reports (CMTRs) documenting the conformance of all materials supplied to the applicable ASTM requirements specified in Paragraph 2.1.1.

1.6.3 Documentation of the material tests specified in Paragraph 2.2.7.

1.6.4 Documentation of the performance tests, specified in Paragraph 2.1.2.3, verifying the performance of bar splices made with mechanical connectors.

1.6.5 Splice procedures developed according to Paragraph 2.1.2.4 to be used in making bar splices with mechanical connectors.

1.6.6 Documentation of the certification of each person involved in making a bar splice with a mechanical connector per Paragraph 2.1.2.5.

1.6.7 Inspection reports documenting that bar splices made with mechanical connectors, as required in Paragraph 3.3.1 were made in compliance with the approved splicing procedures by qualified splicers.

1.6.8 Reinforcing steel welding procedures, welder qualifications, testing and inspection records as defined in Paragraphs 3.2.4 and 3.3.5 through 3.3.7.

1.6.9 Certified Material Test Reports (CMTRs) for filler material shall be submitted for Buyer review.

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1.6.10 Inspection reports on field bent/straightened bars as defined in Paragraph 3.3.3.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Reinforcement

2.1.1.1 Reinforcing Steel: ASTM A615, Grade 60; deformed billet steel bars, plain finish. For bars which are to be welded, Carbon Equivalent value shall also be determined and furnished unless, ASTM A706 low alloy steel deformed bars Grade 60 are used.

2.1.1.2 Welded Wire Fabric: ASTM A185 Plain Type; in flat sheets or coil rolls; plain finish.

2.1.2 Mechanical Connectors

2.1.2.1 Mechanical connectors for splicing reinforcing steel shall be Lenton taper threaded rebar splices by Erico Products or equal. Mechanical connectors shall have compatible accessories for mounting flush to formwork including internal coupler protectors and external bar end protectors.

2.1.2.2 Mechanical connectors shall develop in tension or compression at least 125 percent of the specified yield strength of the reinforcing steel.

2.1.2.3 Mechanical connectors for each bar size and splice type to be used in construction shall be qualified for use based on the following performance tests:

- A. Static Tensile Strength Tests - Six splice specimens of the bar-to-bar connection for each bar size and grade shall be subjected to tensile strength tests in accordance with ASTM A370 test methods. Conduct a tensile strength test on an unspliced specimen from the same bar used for the spliced specimen to establish the actual yield and tensile strength of each bar.

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All test specimens shall meet the requirements of Paragraph 2.1.2.2. Each individual test report on both the spliced and unspliced specimens shall include at least the following information:

- 1) Yield strength
- 2) Tensile strength
- 3) Total elongation
- 4) Load-elongation curve or data up to failure load
- 5) Mode of failure.

The gauge length for each pair of spliced and unspliced specimens shall be the same, and equal to the length of the splice sleeve plus one to three bar diameters at each end.

- B. Cyclic Tests - Three splice specimens of the bar-to-bar connection for each bar size and grade shall be subjected to 100 cycles of tensile stress variations from 5 percent to 90 percent of the specified minimum yield strength of the reinforcing bar. One cycle is defined as an increase from the lower load to the higher load and return.

The specimens shall withstand the cyclic test without loss of static tensile strength capability when compared with like specimen in A. above and tested statically to failure following cyclic tests.

- 2.1.2.4 Procedures for producing a splice shall be developed by Seller in accordance with recommendations of the manufacturer of the mechanical connector and shall include, as a minimum, the following information:

- A. Procedures used for performance tests
- B. Type of equipment and methods used to verify bar thread acceptability
- C. Cleanliness requirements
- D. Type of equipment and methods used for torquing
- E. Required torque, tolerance on required torque, and method of measurement
- F. Method used to lock the coupling in place to prevent loosening of the splice

G. Method used to verify the final alignment and engagement of the splice coupler on both bars

- 2.1.2.5 Personnel (splicer) involved in the production of the splices shall be trained and certified to follow the procedures developed per Paragraph 2.1.2.4, prior to performing any production splices. Initial training and certification shall be by the manufacturer. Additional personnel may be trained and certified by the Seller's personnel who have been trained and certified by the manufacturer.
- 2.1.3 Accessory Materials
- 2.1.3.1 Tie Wire: Minimum 16 gauge, black, annealed type.
- 2.1.3.2 Chairs, bolsters, bar supports, dobies, spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
- 2.1.3.3 Special chairs, bolsters, bar supports, spacers adjacent to weather exposed concrete surfaces (not in contact with soil): Plastic coated steel type; size and shape as required.
- 2.2 FABRICATION AND MANUFACTURE
- 2.2.1 Fabricate concrete reinforcing steel in accordance with the standard fabricating tolerances in ACI SP-66 and to the dimensions shown on the Contract Drawings.
- 2.2.2 All reinforcement shall be bent cold.
- 2.2.3 Store reinforcing steel off the ground and protect from oil or other deleterious materials.
- 2.2.4 Rust, seams, surface irregularities, or mill scale will not be cause for rejection, provided the weight and height of deformations of a hand-wire-brushed test specimen are not less than the applicable ASTM specification requirements.
- 2.2.5 Tag bundles of reinforcing bars and mechanical couplers showing quantity, grade, size, heat number, and suitable identification to allow checking, sorting and placing; use embossed metal tags. Tags printed on weather and tear resistant material, such as is manufactured by "Tyvek" using indelible ink is an acceptable alternate to embossed metal tags.
- 2.2.6 Mechanical couplers and bar threads shall be protected from damage during shipping, handling and installation.

- 2.2.7 Tension tests of reinforcing steel shall be provided in accordance with ASTM A615 for each 50 tons or lesser quantities of each bar size produced from each heat of steel.
- 2.2.8 Weld reinforcing bars in accordance with AWS D1.4; do not tack weld crossing bars for assembly of reinforcement.

PART 3 EXECUTION

3.1 PREPARATION

Clean reinforcement prior to installation to remove loose rust and mill scale (removable with a wire brush), earth, ice and other materials which may reduce or destroy the bond with the concrete.

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Placement

- 3.2.1.1 Place, support and secure all reinforcement to prevent displacement from its required position. Reinforcement placing tolerances shall meet the requirements of ACI 301 Chapter 5. Bars shall be tied securely to prevent displacement and all dowels shall be securely held in place prior to depositing concrete.

- 3.2.1.2 Splice reinforcement as indicated on the approved placement drawings.

- 3.2.1.3 Care shall be taken to not displace or puncture the vapor barrier where shown on the Contract Drawings.

- 3.2.1.4 Accommodate placement of formed openings.

- 3.2.1.5 Splices in welded wire fabric shall be made by lapping a minimum of one spacing of the outermost cross wires of each fabric plus 2 inches unless noted otherwise on the placement drawings.

- 3.2.1.6 Maintain concrete cover around reinforcing as specified on the placement drawings.

3.2.2 Mechanical Connectors

- 3.2.2.1 Mechanical connectors for splicing reinforcing steel shall be placed and tightened in accordance with the splicing procedures of Paragraph 2.1.2.4 by personnel trained and qualified per Paragraph 2.1.2.5.

- 3.2.2.2 Internal coupler protectors and external bar end protectors shall not be removed until a mechanical connection is ready to be made.

- 3.2.3 Field Bending/Straightening of Steel Reinforcing Bars
- 3.2.3.1 If the Contract Drawings call for field bending of steel reinforcing bars partially embedded in hardened concrete or, where prior written approval is obtained case by case from the Buyer to correct interference or misplacement, the Seller shall bend/straighten bars in accordance with the provisions given herein.
- 3.2.3.2 Field bending/straightening of steel reinforcing bars shall be limited to bar size No. 11 and smaller.
- 3.2.3.3 Heat shall be applied as described below for bending/straightening bar size No. 6 through No. 11, or for bending/straightening bar size No. 5 and smaller when those bars have been previously bent. Field bending/straightening shall not be done when air temperature is lower than 40°F.
- 3.2.3.4 Previously unbent bars of size No. 5 and smaller may be bent/straightened without heating.
- 3.2.3.5 A bending tool with bending diameter as shown in Table 1 shall be used. Any bend shall be limited to 90 degrees. Make the bend gradually.

TABLE 1 - RATIOS OF BEND DIAMETER TO BAR DIAMETER

BAR SIZE	BEND INSIDE DIAMETER/BAR DIAMETER	
	NOT HEATED	HEATED
#3, 4, 5	8	8
#6, 7, 8, 9	Not Permitted	8
#10, 11	Not Permitted	10

- 3.2.3.6 Maintain the steel temperature within the required range in Table 2 during the entire bending process.

TABLE 2 - TEMPERATURE LIMITS FOR HEATING BAR

BAR SIZE	MINIMUM TEMPERATURE (°F)	MAXIMUM TEMPERATURE (°F)
#3, 4	1200	1250
#5, 6	1350	1400
#7, 8, 9	1400	1450
#10, 11	1450	1500

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3.2.3.7 In applying heat for field bending/straightening, the entire length of the portion of the bar to be bent (or entire length of the bend to be straightened) shall be heated plus an additional 2 inches at each end. For bars larger than No. 9, two heat tips shall be used simultaneously at opposite sides of the bar to assure a uniform temperature throughout the thickness of the bar.

3.2.3.8 Heating of bars must be performed in a manner that will avoid damage to the concrete such as, application of protective insulation when bend area is within 6 inches of the concrete surface. Heating of bars shall be controlled by temperature-indicating crayons or other means. The heated bars shall not be artificially cooled with water, forced air or other means.

3.2.4 Reinforcing Steel Welding

3.2.4.1 Welding of reinforcing steel, when specified on the Contract Drawings, shall conform to the requirements of AWS D1.4. The Seller shall submit for Buyer's approval welding procedures compatible with the steel weldability.

3.2.4.2 Welders and welding operators shall be qualified by tests as prescribed in Section 6.3 of AWS D1.4. All welded splices shall be qualified in accordance with Section 6.2 of AWS D1.4.

3.3 FIELD QUALITY CONTROL

The Buyer shall ensure specified field tests are performed independently from the work being carried out to verify the work is accomplished in accordance with this specification section and the Contract Drawings. The Seller shall coordinate the work performed with specified testing activities.

3.3.1 All splices made with mechanical connectors shall be inspected to verify that installation is in compliance with the approved production splicing procedures.

3.3.2 Field testing of completed mechanical connections is not required.

3.3.3 Field bent or straightened bars conforming to Paragraph 3.2.3 herein shall be visually inspected for cracks.

3.3.4 The standards of acceptance for bar weld quality shall be in accordance with Section 4.4 of AWS D1.4.

3.3.5 Inspection of welding materials, procedures, welder qualification and equipment shall be in accordance with Section 7 of AWS D1.4.

3.3.6 All welds shall be visually inspected.

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3.3.7 All direct butt weld splices shall be inspected by radiograph testing as prescribed in Paragraphs 4.4.9 and 7.7.3 of AWS D1.4. Ten (10) percent of each type of all other welds shall be tested by magnetic particle or dye penetrant method as prescribed in Section 7.7 of AWS D1.4 unless specified otherwise on the Contract Drawings.

3.3.8 Welds tested nondestructively or visually inspected that do not meet the requirements shall be repaired using the applicable provisions of AWS D1.4.

3.4 ADJUSTMENT

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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Richland, Washington
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FLUOR DANIEL, INC.
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SECTION 03252
CONCRETE ANCHORS
B-595-C-B210A-03252

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	NO		
QUALITY LEVEL	I <u>X</u>	II		
SAFETY CLASS	1	2	3 <u>X</u>	4

ORIGINATOR:

M. S. Whitten 7/13/93
M. S. Whitten, Structural Eng. Date

CHECKER:

E. Jorgensen 7-13-93
E. Jorgensen, Structural Engineer Date

APPROVED BY:

M. S. Whitten
M. S. Whitten Lead Discipline Engineer

7/13/93
Date

JUL 15 1993

SECTION 03252
 CONCRETE ANCHORS
 B-595-C-B210A-03252

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SECTION 03252 CONCRETE ANCHORS

PART 1 GENERAL

1.1 SUMMARY

This section covers the technical requirements for the furnishing and installation of concrete anchors. Concrete anchors are considered to be anchor bolts installed in fresh concrete.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M	1990 Standard Specification for Structural Steel
ASTM A153	1982 (R1987) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A193/A193M	1990 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194/A194M	1990 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A240	1991 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A307	1990 Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength
ASTM A563	1991 Standard Specification for Carbon and Alloy Steel Nuts
ASTM F436	1990 Standard Specification for Hardened Steel Washers

1.3 RELATED REQUIREMENTS

Specification Section 05059 Welding Stainless Steel Liners

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certified Material Test Reports (CMTRs) documenting the conformance of all materials as specified in Paragraph 2.1.1.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Anchor Bolts

Unless noted otherwise on the Contract Drawings, an anchor bolt assembly shall consist of a bolt threaded at both ends supplied with 2 heavy hex nuts, one for each end (an acceptable alternate to a threaded bolt with a bottom nut is a heavy hex head bolt), and one washer (only when specified on the Contract Drawings), conforming to the following requirements:

Carbon Steel

Anchor Bolts	-	ASTM A307	Grade C, or A36
Heavy Hex Nuts	-	ASTM A563	Grade A
Hardened Washers	-	ASTM F436	
Heavy Hex Head Bolt	-	ASTM A307	Grade B (Optional)

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When galvanized anchor bolts are specified on the Contract Drawings, anchor bolts, nuts and washers shall be galvanized in accordance with ASTM A153. Additional lock nut and/or levelling unit when specified on the Contract Drawings shall be furnished.

Stainless Steel

Anchor Bolts	-	ASTM A193	Grade B8
Heavy Hex Nuts	-	ASTM A194	Grade B
Washers	-	ASTM A240	Type 304L

2.1.2 Sleeves

Sleeves for anchor bolts shall conform to the requirements specified on the Contract Drawings.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Fabricate anchor bolts to the dimensions and details shown on the Contract Drawings. All anchor bolt and nut thread engagement shall be inspected prior to shipment or installation.

2.2.2 Anchors bolts shall be bundled and tagged showing quantity, grade, size and suitable identification to allow checking, sorting and proper placement in the field; use embossed metal tags. Tags printed on weather and tear resistant material, such as is manufactured by "Tyvek" using indelible ink is an acceptable alternative to embossed metal tags. Carbon steel and stainless steel anchor bolts shall be bundled separately.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Location of concrete anchors, anchor quantity, anchor diameter and anchor type shall be as shown on the Contract Drawings.

3.2.2 Relocation of a concrete anchor from the position shown on the Contract Drawings requires the approval of the Buyer.

3.2.3 Welding to concrete anchors is not allowed except welding of the bottom nut as shown on the Contract Drawings. Such welding shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners, as applicable for carbon steel.

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3.2.4 Install anchor bolts in cast-in-place concrete in accordance with the details and tolerances indicated on the Contract Drawings.

3.3 FIELD QUALITY CONTROL

3.3.1 All anchor bolt installations shall be inspected prior to and during concrete placement to assure correct size, length, projection and location is provided.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 03300
CAST-IN-PLACE CONCRETE
B-595-C-B210A-03300

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>X</u>	II	<u> </u>
SAFETY CLASS	1	<u>X</u>	2	<u> </u>
			3	<u> </u>
			4	<u> </u>

ORIGINATOR:

CHECKER:

M. S. Whitten 7/13/93
M. S. Whitten, Structural Engineer Date

E. Jorgensen 7-13-93
E. Jorgensen, Structural Engineer Date

APPROVED BY:

M. S. Whitten
M. S. Whitten Lead Discipline Engineer

7/13/93
Date

JUL 15 1993

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SECTION 03300
CAST-IN-PLACE CONCRETE
B-595-C-B210A-03300

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SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

This section covers the technical requirements for installation, inspection and testing of cast-in-place and precast concrete work as shown on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301	1989 Specification for Structural Concrete for Buildings
ACI 304R	1989 Guide for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	1989 Hot Weather Concreting
ACI 306R	1988 Cold Weather Concreting
ACI 347R	1988 Guide to Formwork for Concrete
ACI SP-4	1989 Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C531	1985 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing
ASTM C579	1982 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing
ASTM C827	1987 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM D412	1987 Standard Test Methods for Rubber Properties in Tension

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1.3 RELATED REQUIREMENTS

Specification Section 03010	Metallic Topping
Specification Section 03200	Concrete Reinforcement
Specification Section 03252	Concrete Anchors
Specification Section 05059	Welding - Stainless Steel Liners
Specification Section 05123	Miscellaneous Metals
Specification Section 07160	Bituminous Dampproofing
Specification B-595-A-A900-03346	Ready-Mixed Concrete Production and Delivery
Specification B-595-A-A910-01650	Inspection and Testing Services

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEMS DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Concrete placement schedule per Paragraph 3.2.4.2.
- 1.6.2 Jobsite records of placed concrete per Paragraph 3.2.4.6 and documentation on inspection per Paragraph 3.3.2.
- 1.6.3 Documentation of testing as defined in Paragraph 3.3.1.
- 1.6.4 Waterstop product data and Certified Material Test Reports (CMTRs) as defined in Paragraph 2.1.5.
- 1.6.5 Epoxy grout product data, installation instructions and field test results as defined in Paragraphs 2.1.6, 3.2.10.1 and 3.3.1.3, respectively.
- 1.6.6 Shop erection and detail drawings for precast concrete.

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1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Concrete

2.1.1.1 Concrete shall be mix design classes from Table 1 of Specification B-595-A-A900-03346, Ready-Mixed Concrete Production and Delivery. Use mix design classes as specified on the Contract Drawings or as specified below.

2.1.1.2 Concrete specified on the Contract Drawings as Mix Design Classes MC3, MC3P, ST4 and ST4P shall have a minimum dry density of 147 pounds per cubic feet and mix design Classes HD1 and HD1P shall have a minimum dry density of 190 pounds per cubic foot to satisfy radiation shielding requirements.

2.1.1.3 Concrete for underground duct banks shall be Mix Design Class M. The top surface of all underground duct banks shall be colored red. The color may be applied by sprinkling red iron oxide powder over freshly poured concrete at the rate of 0.1 pounds per square foot of concrete surface, or painting the surface after concrete has hardened and cured.

2.1.2 Reinforcement

Reinforcement shall be in accordance with Specification Section 03200, Concrete Reinforcement.

2.1.3 Concrete Anchors

Concrete Anchors shall be in accordance with Specification Section 03252, Concrete Anchors.

2.1.4 Steel Embedments

Steel embedments shall be in accordance with Specification Section 05123, Miscellaneous Metals.

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2.1.5 Waterstop

Waterstop shall be 3/8-inch thick dumbbell type of styrene-butadiene synthetic rubber, and the widths shown on the Contract Drawings. Polyvinyl chloride or other non-rubber materials are not acceptable substitutions. Tensile strength shall be 3000 psi minimum and ultimate elongation shall be 450 percent minimum when tested per ASTM D412. Field splices shall be made in accordance with manufacturers instructions. Waterstop shall be able to withstand a maximum design hydrostatic head of 30 feet.

2.1.6 Epoxy Grout

Epoxy grout shall be a nonshrink, preproportioned, factory packaged product consisting of specially formulated resin, hardener and aggregate which when mixed together forms pourable 100 percent solid grout. Grout shall be Five Star Epoxy Grout by U.S. Grout Corporation or approved equal having the following physical properties:

Volume Change, ASTM C827:	0 percent shrinkage, 2 percent maximum expansion at all ages.
Compressive Strength, ASTM C579:	5000 psi minimum in 7 days
Coefficient of Expansion, ASTM C531:	30×10^{-6} in/in/°F maximum.

Epoxy grout containers and packages shall indicate product "shelf life."

Store epoxy grout in accordance with the manufacturer's printed instructions.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Obtain pre-placement inspection and authorization from the Buyer before proceeding with concrete placement.

3.1.2 Prior to placing concrete verify that all reinforcing steel including concrete cover, anchor bolts and other embedded items are accurately placed and secured in accordance with the Contract and Fabrication Drawings.

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- 3.1.3 Construction joints shall be as shown on the Contract Drawings and prepared in accordance with ACI 301, Section 6.1 and Section 8.5. Modify Section 6.1.4.3 as follows: Roughen the concrete surface uniformly to a full amplitude of approximately 1/4 inch in a manner that will remove laitance, loosened aggregate or damaged concrete at the surface. Where metal forms, such as "Stay-Form" are used, all loose material shall be removed and the joint shall be prepared as stated above except that the 1/4" amplitude roughness is provided by the form configuration.
- 3.1.4 Remove laitance and concrete splatter from protruding reinforcing steel after each concrete placement.
- 3.1.5 All equipment for transporting concrete shall be clean and free of hardened concrete. Do not use equipment made of aluminum or aluminum alloys to mix, handle, convey or place concrete.
- 3.1.6 All debris and ice shall be removed from spaces to be occupied by concrete. Concrete shall not be cast against frozen surface.
- 3.1.7 Forms shall be properly coated and prepared in accordance with Section 4.4 of ACI 301. Form release agents shall be water base type.
- 3.1.8 Reinforcement shall be clean of ice, earth, loose rust and mill scale or other deleterious coatings.
- 3.1.9 Standing or puddled water shall be removed from place of deposit before concrete is placed.

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Formwork

- 3.2.1.1 Formwork design and installation shall be in accordance with ACI 301, Chapter 4, ACI 347R and ACI SP-4. Tolerances on formed surfaces shall be in accordance with ACI 301, Table 4.3.1, except that the interior surface of the canyon walls shall not exceed a variance from plumb of 1/4 inch in any 10 feet of height or length, nor 1/2 in total height (from base mat to underside of second floor hatch covers) or length. Form exposed exterior corners above grade of structures and foundations with a one inch by one inch chamfer unless noted otherwise on the Contract Drawings.
- 3.2.1.2 Formwork with a stainless steel liner included shall be sufficiently rigid to satisfy the flatness requirement specified in Specification Section 05123, Miscellaneous Metals.
- 3.2.1.3 Do not attach any temporary or forming attachments of carbon steel material to embedded items of stainless steel material.

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- 3.2.1.4 Do not remove forms and shoring used to support the vertical weight of concrete until the concrete has reached a minimum compressive strength of 4000 psi.
- 3.2.1.5 Do not remove forms and shoring used to support the lateral weight of concrete until the concrete has reached a compressive strength of 2000 psi.
- 3.2.1.6 The concrete shall be presumed to have attained the specified strength for form removal when the requirements of ACI 301, Section 4.7 have been met.
- 3.2.1.7 Do not remove forms used for curing before the expiration of the required curing period.
- 3.2.1.8 Remove temporary attachments to embedded items such as lifting pads, erection brackets and alignment mounts by machining or grinding. Restore surfaces of the embedded items to the original condition by grinding or by welding followed by grinding in accordance with Specification Section 05059, Welding Stainless Steel Liners.
- 3.2.2 Placing Reinforcement

Place reinforcement in accordance with Specification Section 03200, Concrete Reinforcement. Field bending/straightening of bars partially embedded in hardened concrete shall be per requirements given in the above referenced section.
- 3.2.3 Placing Concrete Anchors

Place concrete anchors in accordance with Specification Section 03252, Concrete Anchors.
- 3.2.4 Placing Concrete
 - 3.2.4.1 Place concrete in accordance with ACI 301, Chapter 8, except as modified by the supplemental requirements herein.
 - 3.2.4.2 Prepare concrete placement drawing for each concrete pour for Buyer's approval. The drawing shall address the following items:
 - A. Pour number
 - B. Extent of pour, plan and elevation views
 - C. Volume of concrete
 - D. Reference to concrete mix class and applicable submitted reinforcing steel placing drawings

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- E. Location of all embedded items such as plates, frames, pipe sleeves, inserts, conduit, anchor bolts and construction aids
 - F. Openings
 - G. Construction joint preparation and surfacing
 - H. Materials and methods of curing
 - I. Formwork removal timing and sequence
- 3.2.4.3 Concrete conveying by pumping shall meet the requirements of ACI 304R, Chapter 9. Concrete conveying by belt conveyors shall meet the requirements of ACI 304R, Chapter 10.
- 3.2.4.4 When the ambient temperature is below 40°F or expected to be below 40°F within 24 hours thereafter of concrete placement, the provisions of ACI 306R shall be followed.
- 3.2.4.5 When the ambient temperature is above 90°F or expected to be above 90°F at time of concrete placement, the provisions of ACI 305R shall be followed.
- 3.2.4.6 Maintain a jobsite record of placed concrete. Record date, time, location, quantity, air temperature, concrete temperature, delivery slip number and cylinder sample numbers.
- 3.2.4.7 After concrete placement and form removal, clean exposed reinforcing steel and embedded items of concrete splatter, dirt and other foreign matter. Mechanical cleaning tools used on stainless steel surfaces, such as grinding wheels, files, deburring tools and wire brushes, shall be made of stainless steel. Markings on these tools shall identify tools to be used on stainless steel only and be visible while tool is in use.
- 3.2.4.8 Seller shall leave construction joints for future contractors, prepared in accordance with the requirements of Paragraph 3.1.3.
- 3.2.4.9 Concrete that has achieved initial set or has been contaminated by foreign materials shall not be deposited in the structure. Retempered concrete shall not be used.
- 3.2.4.10 The Vitrification building concrete mat, walls and the first floor shall be considered as massive concrete and provisions of ACI 301 Chapter 14, Paragraph 14.4 for placing shall apply.
- 3.2.5 Finishing Formed Surfaces
- 3.2.5.1 Finish formed surfaces in accordance with ACI 301, Chapter 10, except as modified by the supplemental requirements herein.

- 3.2.5.2 All interior formed surfaces and all exterior formed surfaces which remain visible or exposed to public view shall have a "smooth form finish."
- 3.2.5.3 Formed surfaces exposed to earth, may have a "rough form finish."
- 3.2.5.4 Concrete walls exposed to earth shall receive a bituminous coating in accordance with Specification Section 07160, Bituminous Dampproofing.
- 3.2.6 Slabs
 - 3.2.6.1 Construct slabs in accordance with ACI 301, Chapter 11, except as modified by the supplemental requirements herein.
 - 3.2.6.2 Slabs shall have a "trowelled finish" and be finished to a "Class A Tolerance," unless noted otherwise on the Contract Drawings.
 - 3.2.6.3 Slabs noted to be poured to a "rough pour elevation" and to receive a concrete topping, shall have a "floated finish" and be finished to a "Class B Tolerance," unless noted otherwise on the Contract Drawings.
 - 3.2.6.4 Finish or prepare the concrete floor surface receiving metallic topping in accordance with Specification Section 03010, Metallic Topping.
- 3.2.7 Curing and Protection
 - 3.2.7.1 Cure and protect concrete in accordance with ACI 301, Chapter 12, except as modified by the supplemental requirements herein.
 - 3.2.7.2 For massive concrete as defined in Paragraph 3.2.4.10, cure and protect concrete in accordance with ACI 301, Chapter 14, Paragraph 14.5.
 - 3.2.7.3 Concrete surfaces not in contact with forms can utilize any of the methods indicated in ACI 301, Section 12.2.1, for preservation of moisture, except slabs to receive a metallic topping shall not be cured with a curing compound.
- 3.2.8 Patching

Repair of surface defects shall be performed only with the approval of the Buyer and shall be performed in accordance with ACI 301, Chapter 9.

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3.2.9 Precast Concrete

Precast concrete floor panels, hatchcovers, plugs and other items shall be fabricated and erected in accordance with the dimensions, tolerances and materials shown on the Contract Drawings and shop drawings.

3.2.10 Placing of Epoxy Grout

3.2.10.1 The Seller shall prepare and submit for Buyer's approval written instructions conforming to the epoxy grout manufacturer's recommendations for the surface preparation, mixing, placing, finishing and curing of the grout.

3.2.10.2 Do not use grout with expired shelf life unless it has been retested and found conforming to the physical properties specified in Paragraph 2.1.6.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

3.3.1.1 The Buyer shall ensure specified field tests are performed independently from the work being carried out to verify the work is accomplished in accordance with this specification section and the Contract Drawings. The Seller shall coordinate the work performed with specified testing activities. Concrete testing is defined in Specification B-595-A-A910-01650, Inspection and Testing Services, Paragraph 3.2.2 and below:

- A. Tests for slump, air content and concrete temperature shall be made for the first delivery of each class of concrete each day and every 50 cubic yards thereafter.
- B. Tests for slump, air content, concrete temperature and unit weight shall be made for each strength test.
- C. At least one strength test shall be made per day for each class of concrete placed.
- D. For structures and foundations at least one strength test shall be made per 150 cubic yards or per 5000 square feet of surface area of slabs or walls, whichever is less.
- E. A test for the dry density of Mix Design Classes MC3, MC3P, ST4, ST4P, HD1 and HD1P shall be made once each day for the first delivery of each class of concrete.

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3.3.1.2 In-place concrete, tests of which, do not meet the requirements of ACI 301, Section 17.2, shall be subject to further tests as directed by the Buyer. Such testing may include the testing of core cylinders taken from the completed work, or the performance of load tests.

3.3.1.3 For epoxy grout make 4 test cubes in the field for each batch of grout mixed and placed; make test cubes according to applicable provisions of ASTM C579, Method B. Cure and test 2 cubes after 24 hours and 2 cubes after 7 days for compressive strength per ASTM C579, Method B.

3.3.2 Inspection

3.3.2.1 Reinforcing bar placement, concrete cover, formwork preparation and position of embedded items shall be inspected for compliance with the Contract Drawings prior to the placement of the concrete.

3.3.2.2 The concrete shall be inspected immediately upon the removal of the forms for honeycombs or embedded debris. Repair surface defects per Paragraph 3.2.8.

3.3.2.3 The concrete shall be inspected to ascertain that concrete work is performed in compliance with the requirements of this specification section and the Contract Drawings.

3.3.2.4 Verify all precast concrete items are fabricated and installed in accordance with the specified dimensions and tolerances.

3.3.3 Evaluation and Acceptance

The evaluation and acceptance of the concrete work shall meet the requirements of ACI 301, Chapters 17 and 18.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

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3.8 SCHEDULES
(Not Used)

END OF SECTION

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SECTION 05062A
WELDING PIPING
B-595-C-B210A-05062A

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA YES NO X
QUALITY LEVEL I X II
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

A. Estrada 7/8/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 7-8-93
D. A. Buzzelli, Lead Discipline Eng. Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

U.S. DEPARTMENT OF ENERGY
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SECTION 05062A
WELDING PIPING
B-595-C-B210A-05062A

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ATTACHMENTS

ATTACHMENT TITLE

A SUMMARY OF HEAT TREATMENT AND NDE REQUIREMENTS FOR WELDED PIPING

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SECTION 05062A WELDING PIPING

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, thermal treatment, examination and testing requirements for stainless steel and Hastelloy C-22 piping.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3 1990 Chemical Plant and Petroleum
Refinery Piping

Boiler and Pressure Vessel Code

ASME Section II, 1989 (Addenda 90) Welding Rods,
Part C Electrodes, and Filler Metals

ASME Section V 1989 Nondestructive Examination

ASME Section VIII, 1989 Rules For Construction of
Division 1 Pressure Vessels

ASME Section IX 1989 (Addenda 90) Welding and
Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A 1988 Recommended Practice -
Personnel Qualification and
Certification in Nondestructive
Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 1986 Standard Symbols for Welding,
Brazing and Nondestructive
Examination

AWS A3.0	1989 Welding Terms and Definitions Including Terms for Brazing, Soldering, Thermal Spraying and Thermal Cutting
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe without Backing
AWS QC1	1988 Standard and Guide for Qualification and Certification of Welding Inspectors

1.3 RELATED REQUIREMENTS

Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys
Specification Section 15060	Piping Material, Fabrication, Erection and Pressure Testing (Alloy Piping)

1.4 DEFINITIONS

CMTR - Certified Material Test Report
NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent) and Procedure Qualification Records (ASME Form QW-483 or equivalent) shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with ASME Section IX and this specification section. Seller shall review the contractor's procedures prior to submittal to Buyer to verify their conformance to the requirements of this specification section.
- 1.6.2 Welder Performance Qualifications (ASME form QW-484 or equivalent) shall be submitted for Buyer review. This requirement shall also pertain to purchased items contracted by Seller.

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- 1.6.3 Repair procedures for welds shall be submitted for Buyer approval. The procedure shall list the repair steps, examination methods and welding procedure specification used during weld repair.
- 1.6.4 Final weld nondestructive examination (NDE) and inspection reports shall be submitted for Buyer review. These shall include visual inspection reports and radiographic film.
- 1.6.5 Attachment A summarizing application of individual welding procedures with regards to types of joints and piping material line classes shall be submitted for Buyer approval. Welding shall not begin until these documents are returned to Seller with authorization to proceed.
- 1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS
(Not Used)
- 1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS
(Not Used)

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
 - 2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.
 - 2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.
 - 2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux is not acceptable.
 - 2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.
 - 2.1.5 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendations. Hastelloy C-22 SMAW electrode shall be stored in an electrode oven before use. Oven temperature shall be between 300°F and 400°F, inclusive.

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- 2.1.6 Submerged arc welding shall be performed using both the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.
- 2.1.7 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.
- 2.1.8 A minimum of 2 passes are required on all socket weld connections.
- 2.1.9 For dissimilar joints in base material consisting of stainless steel on one side and Hastelloy C-22 on the other, the filler metal shall meet the requirements of ASME classifications ENiCrMo-10 and ERNiCrMo-10.

2.2 FABRICATION AND MANUFACTURE

2.2.1 General Requirements

- 2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME B31.3. Conformance to this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.
- 2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.
- 2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.
- 2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.
- 2.2.1.5 Peening of welds is not permitted.
- 2.2.1.6 All weld spatter, burrs, etc. shall be removed/ground out in their entirety and blended smoothly with the pipe surface.
- 2.2.1.7 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.
- 2.2.1.8 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the pipe surface. The remaining material shall then be ground flush with the base metal. Grinding shall not reduce the pipe wall thickness below 0.875 times the nominal wall thickness.

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The ground area shall be inspected for cracks or porosity by liquid penetrant examination. Liquid penetrant examination shall be in accordance with Paragraph 3.2.4.

- 2.2.1.9 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.
- 2.2.1.10 Attachment A of this specification section summarizes heat treatment, inspection and nondestructive examination requirements for shop and field welds.
- 2.2.1.11 All butt joint welds shall be full penetration. This includes secondary containment portion of double-jacketed piping.
- 2.2.1.12 Piping root pass welds shall be made by the GTAW process with filler metal added. Fill passes and cap pass welds can be deposited by any of the processes listed in Paragraph 2.2.3. The root pass on said welds shall be made with back-purging gas. The purge shall be maintained until not less than .250 inch of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.
- 2.2.1.13 GTAW process for circumferential butt joint welds without filler metal (autogenous welding) may be acceptable provided the Seller submits all pertinent technical information and receives authorization. Welds shall be made using an automatic orbital welder.
- 2.2.2 Welding Qualifications
 - 2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder Performance Qualifications shall be in accordance with ASME B31.3. They shall also be in accordance with this specification section.
 - 2.2.2.2 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.
 - 2.2.2.3 When consumable inserts are used for stainless steel and Hastelloy C-22 butt joints, the welding procedure must be qualified with an insert.
 - 2.2.2.4 Tack welds shall be made by qualified welders. Approved Welding Procedure Specifications shall be used.
- 2.2.3 Acceptable Welding Processes
 - 2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

	<u>Welding Process</u>	<u>AWS Letter Designation</u>
	Shielded Metal Arc Welding	SMAW
	Manual and Automatic Gas Tungsten Arc Welding	GTAW
	Automatic Submerged Arc Welding	SAW
2.2.3.2	Other welding processes such as Gas Metal Arc or Semi-Automatic Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.	
2.2.3.3	SAW welding process shall not be used on Hastelloy C-22.	

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal or plasma cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel thermal cutting shall not be used for joint preparation of stainless steel and Hastelloy C-22.
- 3.1.2 Permanent backup strips or backing rings are not permitted without specific written authorization from Buyer. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the area shall be performed both visually and by liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.4.
- 3.1.3 Where specific details of fabrication are not shown on the contract documents, fabrication shall be in accordance with ASME B31.3.
- 3.1.4 When branch reinforcement is required, it shall be shown on design drawings. Welding shall be in accordance with ASME B31.3.
- 3.1.5 To minimize the contamination of stainless steel and Hastelloy C-22, Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.6 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.

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- 3.1.7 Joint edges and adjacent surfaces to be welded shall be wire brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.8 Wire brushes shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel and Hastelloy C-22 such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel and nickel alloys only. Marking shall be visible while tool is in use.
- 3.1.9 Grinding shall be done in such a method that overheating of stainless steel and Hastelloy C-22 base metal and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.
- 3.1.10 For Hastelloy C-22, an area one inch wide minimum on each side of the weld joint shall be ground to bright metal prior to welding. An 80 grit abrasive wheel shall be used to perform this grinding.
- 3.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.
- 3.2 **INSTALLATION, APPLICATION and ERECTION**
 - 3.2.1 All welds shall be made in accordance both with Contract Documents and Seller's fabrication drawings.
 - 3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.
 - 3.2.3 Thermal Treatment
 - 3.2.3.1 Minimum mandatory preheating temperatures for thermal cutting, tack welding and welding shall be in accordance both with ASME B31.3, Table 330.1.1 and Attachment A. The minimum preheat temperature shall be sufficient to remove all moisture prior to welding.
 - 3.2.3.2 Interpass temperature for stainless steel shall not exceed 350°F. Do not strike an arc when the point to be welded is at a temperature of 350°F or above.
 - 3.2.3.3 Interpass temperature for Hastelloy C-22 shall not exceed 200°F. Do not strike an arc when the point to be welded is at a temperature of 200°F or above.

3.2.4 Inspection and Nondestructive Examination

3.2.4.1 General Requirement

Specific nondestructive examination (NDE) requirements for each material and piping line class shall be as noted in Attachment A. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

- A. Buyer may witness any or all examinations with final authority on all NDE interpretation results.

3.2.4.2 Inspection

- A. Seller's welding inspector for visual examination shall be qualified and certified in accordance with AWS QC1 or equal that has been authorized by Buyer.
- B. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.

3.2.4.3 Visual Examination

- A. Visual examination shall be performed in accordance both with ASME B31.3, Paragraph 344.2 and this specification section.
- B. Visual examination shall be performed on accessible surface of all completed welds.
- C. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

3.2.4.4 Liquid Penetrant Examination

- A. Liquid penetrant examination shall be in accordance with ASME Section V, Article 6. Solvent-removable penetrant shall be used.
- B. Penetrant materials shall be in accordance with ASME Section V, Article 6, Paragraph T-625 for sulfur and halogen content regardless of the type of material to be examined.
- C. Liquid penetrant examination of welds shall include a band of base metal no less than 1 inch wide on each side of the weld.
- D. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

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3.2.4.5 Ultrasonic Examination

- A. Ultrasonic examination procedures shall be in accordance both with ASME Section V, Article 5 and ASME B31.3, Paragraph 344.6.2.
- B. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 344.6.2.

3.2.4.6 Radiographic Examination

- A. Radiographic examination procedures and techniques shall be in accordance with ASME B31.3, Paragraph 344.5.
- B. The acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2 and Table 341.3.2A, as applicable.

3.2.5 Charpy Impact Testing

3.2.5.1 Procedure Qualification Record (PQR)

- A. Testing is only required when welding PUREX remote connector nozzles to stainless steel.
- B. Deposited weld metal and both heat affected zones shall be tested with results recorded on the PQR.
- C. Testing shall be in accordance with ASME Section VIII, Paragraph UG-84.
- D. The minimum impact energy shall be 18 ft. lbs. at room temperature.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

3.4.1.2 Unacceptable indications shall be completely removed by chipping gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined by the liquid penetrant method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.4.

- 3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.
- 3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.
- 3.5 CLEANING
(Not Used)
- 3.6 PROTECTION
(Not Used)
- 3.7 DEMONSTRATION
(Not Used)
- 3.8 SCHEDULES
(Not Used)

END OF SECTION

ATTACHMENT A
SUMMARY OF HEAT TREATMENT AND
NDE REQUIREMENTS FOR WELDED PIPING

- 1a. For stainless steel: Preheat base metal to 50 °F for all thicknesses. Maximum interpass temperature shall not exceed 350 °F.
- 1b. For Hastelloy C-22: Preheat base metal to 50 °F for all thicknesses. Maximum interpass temperature shall not exceed 200 °F.
- 2a. Nondestructive examination and acceptance criteria for radiography shall be in accordance with ASME B31.3, Paragraph 341.4, for Normal Fluid Service.
- Exception: 1. 100% of girth and miter groove butt joint welds shall be radiographed.
2. Radiography for Piping Material Class "A", radiography will not be required for electrical penetrations. Electrical penetration can be identified by Specification Section 15060.
- 2b. Nondestructive examination and acceptance criteria for radiography shall be in accordance with ASME B31.3, Paragraph 341.4, for Normal Fluid Service. These requirement pertain to carrier and containment piping.
- Exceptions: 1. 100% of carrier piping girth and miter groove butt joint welds shall be radiographed.
2. Longitudinal welds of split containment fittings and split piping require 5% random radiography or ultrasonic examination. Welds shall be selected from each welder's production of like material and welding process regardless of line class. The acceptance criteria shall be as specified for girth and miter groove welds in ASME B31.3, Table 341.3.2A.
- 3a. Visual examination and acceptance criteria for carrier and containment piping shall be in accordance with ASME B31.3, Paragraph 341.4, for Normal Fluid Service.
- Exceptions: 1. 100% of butt joint welds shall be visually examined.
2. 100% of erection of piping and erected piping shall be visually examined in accordance with ASME B31.3, Paragraphs 341.4.1.a.5 and 341.4.1.a.6.

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SUMMARY OF HEAT TREATMENT AND NDE REQUIREMENTS FOR WELDED PIPING

Contract: 845734

Welding Engineer: A. ESTRADA

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*Blank Denotes Basic Code Requirements

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SECTION 16905
ELECTRICAL TESTING
B-595-C-B210A-16905

APPROVED FOR CONSTRUCTION

REVISION 0 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	<u>X</u>
			3	<u>X</u>
			4	___

ORIGINATOR:

CHECKER:

Charles Simpson 7-14-93
C. C. Simpson, Electrical Engineer Date

A. Larsen 7-14-93
A. Larsen, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

7-14-93
Date

JUL 15 1993

SECTION 16905
ELECTRICAL TESTING
B-595-C-B210A-16905

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SECTION 16905
ELECTRICAL TESTING

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1 This specification section defines the electrical tests, checks, inspections and the Construction Acceptance Tests, CATs requirements for the acceptance of electrical components and/or systems furnished by the Seller.
- 1.1.2 The purpose of the specified tests and inspections is to determine that each component is in compliance with the Contract Drawings and specifications.
- 1.1.3 It is the intent of these requirements to ensure that all workmanship, materials and the manner and method of erection and installation conform to manufacturer's instructions, Contract Drawings and specifications.
- 1.1.4 The Seller shall perform and supervise all tests, checks, inspections and the CATs unless specifically noted otherwise herein or on the Contract Drawings. The Seller shall furnish all test equipment required for the tests performed by him and shall be responsible for providing such safety measures as are required for each test.
- 1.1.5 Seller shall repair or replace and retest any components or installation which are damaged or have failed the initial tests.
- 1.1.6 If permanent power is not available at the time of testing, temporary construction power shall be used to perform these tests.

1.2 REFERENCES

The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 1990 National Electrical Code (NEC)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 81 1983 Guide for Measuring Earth Resistivity,
Ground Impedance, and Earth Surface
Potentials of a Ground System

1.3 RELATED REQUIREMENTS

Specification Section 16100 Electrical Installation

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Procedures, for Buyer's approval, of all tests, checks and inspection including procedures for Construction Acceptance Tests.

1.6.2 Certified Test reports shall be per the requirements of Field Quality Control Section.

1.6.3 The test reports shall contain as a minimum the following information:

- A. Job title
- B. Date of test
- C. Equipment, system, or cable identification
- D. Specific type of test
- E. Description of test instrument and date of calibration
- F. Section of specification defining test
- G. Test results
- H. Signature of person supervising test
- I. Signature of Seller
- J. Space for Buyer's signature

1.6.4 The Seller shall submit to the Buyer for approval, a complete listing of proposed calibrating and testing equipment, including calibration standards with current certification from the National Institute of Standards and Technology.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level

- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Furnish all materials, power supply and test equipment required to perform tests, checks, inspections and the CATs in accordance with this specification section.
- 2.1.2 The calibrating and testing equipment used for tests, checks, inspections and CATs shall be calibrated within six months prior to testing. Seller shall provide proof of calibration.
- 2.1.3 Furnish test equipment calibration traceable to standards of the National Institute of Standards and Technology Certification for all test equipment used in calibration. The calibration results shall be logged and available to the Buyer for inspection.
- 2.1.4 Equipment failing the standards test must not be used until repaired and re-tested. All calibrating and testing equipment shall have valid calibration label affixed to the equipment during usage. The label shall be affixed in a prominent location. When the items requiring calibration are of such a size or configuration that affixing a label is not practical, the item shall be identified with a unique number that is traceable to the calibration sheet or record. The Buyer can, at his discretion, require the calibrating and testing equipment to be checked to the standards. Standard calibrating equipment must not be used as calibration and testing devices in the field.
- 2.1.5 The Seller shall be required, every six months, to verify the standards for the project to calibration standards which have current certification from the National Institute of Standards and Technology.
- 2.1.6 Seller shall be responsible for ensuring that the accuracy of the calibration equipment is equal to or better than the accuracy of the equipment to be calibrated/tested.
- 2.1.7 Seller shall maintain a calibration log showing date, location, name of lab if applicable, certification number and name of certifier. Log must be kept current and available to the Buyer for inspection.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Seller shall submit all test procedures to Buyer for approval prior to testing.

3.2 INSTALLATION, APPLICATION AND ERECTION

Refer to Specification Section 16100, Electrical Installation.

3.3 FIELD QUALITY CONTROL

3.3.1 General

- 3.3.1.1 Construction Acceptance Tests, verifications and inspections shall be performed on the Vitrification Building foundation package, to demonstrate that the completed electrical installation and/or construction package meets the requirements of the Contract Drawings, specifications, and the National Electrical Code. The following specific paragraphs of this specification are contained as a minimum, in the procedures for Construction Acceptance Tests.

A. Paragraph 3.3.2.1

B. Paragraph 3.3.2.2.2

3.3.1.2 Inspection

The Seller shall visually inspect the installation to verify conformance to this specification and the Contract drawings. This inspection shall take into consideration, for example: proper material and conductor identification, verification of completeness, accurate placement, proper attachment of all ground connection.

3.3.2 Grounding

3.3.2.1 Test No. 1 - Individual Ground Rods

Before connection to the ground mat, each ground rod shall be tested for resistance to earth by a Biddle null balance "Earth Tester" using the "Three-Point Method" described in IEEE Standard No. 81 using two auxiliary rods.

- 3.3.2.1.1 Test report shall be submitted to the Buyer.

3.3.2.2 Test No. 2 - Complete Ground Mat

- 3.3.2.2.1 After completion of Test No. 1, all ground rods shall be connected to the ground mat. Before any backfilling the complete ground mat shall be inspected to ensure that all connections have been made solid and/or mechanically tight.

- 3.3.2.2.2 After inspection, backfilling shall be done and the resistance of the complete ground mat to earth shall then be tested. The mat resistance shall be determined by use of the "Fall-of-Potential Method," as described in the IEEE Standard No. 81.

3.3.2.2.3 Test report showing the ground mat resistance value shall be submitted to the Buyer.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

Clean and remove all debris and equipment from the job site after completion of testing.

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 16111
CONDUIT SCHEDULE
B-595-C-B210A-16111

APPROVED FOR CONSTRUCTION

REVISION 0 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	___	NO	X
QUALITY LEVEL	I	___	II	X
SAFETY CLASS	1	___	2	___
			3	X
			4	___

ORIGINATOR:

CHECKER:

Charles C. Simpson 7-14-93
C. C. Simpson, Electrical Engineer Date

A. LARSEN 7-14-93
A. Larsen, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

7-14-93
Date

JUL 15 1993

SECTION 16111
CONDUIT SCHEDULE
B-595-C-B210A-16111

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ATTACHMENTS

ATTACHMENTS

A ELECTRICAL CONDUIT SCHEDULE

SECTION 16111 CONDUIT SCHEDULE

PART 1 GENERAL

1.1 SUMMARY

This section includes the conduit and embed schedule for the Vitrification Building foundation.

1.2 REFERENCES

(Not Used)

1.3 RELATED REQUIREMENTS

Specification Section 16100	Electrical Installation
Specification Section 16110	Electrical Materials and Devices

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

(Not Used)

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A.	Site Elevation	714 feet above sea level
B.	Barometric Pressure	14.3 psia
C.	Outside Design Temperature	
	1) Maximum Design Temperature	110°F
	2) Minimum Design Temperature	-20°F

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 All materials shall be supplied in accordance with Specification Section 16110.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Conduits shall be in accordance with Attachment A of this specification section and Specification Section 16100, Electrical Installation.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

Electrical Conduit Schedule for Package Number B210A

REV NO.	BLDG NO.	RACEWAY NO.	FOR	FROM		TO		RACEWAY DATA			INCLUDED CABLE NOS.
				EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	SIZE	TYPE	MATERIAL OF CONSTR	
0	01	A0001	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0002	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0003	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0004	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0005	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0006	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0007	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0008	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0009	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0010	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0011	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	A0012	ALARM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	C0001	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	C0002	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	C0003	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	C0004	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	C0005	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		

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Electrical Conduit Schedule for Package Number B210A

REV NO.	BLDG NO.	RACEWAY NO.	FOR	FROM		TO		RACEWAY DATA			INCLUDED CABLE NOS.
				EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	SIZE	TYPE	MATERIAL OF CONSTR	
0	01	C0006	COMM	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	2"	COND		
0	01	G0001	ISOLAT	STUB-UP @GRID A-1	H-2-122383-1	STUB-OUT @GRID A-1	H-2-122383-1	2"	COND		1 #4/0 KCMIL COPPER
0	01	G0002	ISOLAT	STUB-UP @GRID A-19	H-2-122383-2	STUB-OUT @GRID A-19	H-2-122383-2	2"	COND		1 #4/0 KCMIL COPPER
0	01	G0003	SPARE;	STUB-UP @GRID A-1	H-2-122383-1	STUB-OUT @GRID A-1	H-2-122383-1	2"	COND		
0	01	G0004	SPARE;	STUB-UP @GRID A-19	H-2-122383-2	STUB-OUT @GRID A-19	H-2-122383-2	2"	COND		
0	01	P0001	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0002	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0003	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0004	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0005	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0006	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0007	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0008	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0009	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0010	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0011	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0012	POWER	STUB-UP @GRID	H-2-122383-3	STUB-OUT @GRID	H-2-122383-3	4"	COND		

Electrical Conduit Schedule for Package Number B210A

REV NO.	BLDG NO.	RACEWY NO.	FOR	FROM		TO		RACEWAY DATA			INCLUDED CABLE NOs.
				EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	EQUIPMENT NUMBER OR LOCATION	PLAN DRAWING	SIZE	TYPE	MATERIAL OF CONSTR	
				H-4		H-4					
0	01	P0013	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0014	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0015	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0016	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0017	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		
0	01	P0018	POWER	STUB-UP @GRID H-4	H-2-122383-3	STUB-OUT @GRID H-4	H-2-122383-3	4"	COND		

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Fluor Contract 8457

SECTION 16100
ELECTRICAL INSTALLATION
B-595-C-B210A-16100

APPROVED FOR CONSTRUCTION

REVISION 2 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u> </u>	II	<u>X</u>
SAFETY CLASS	1	<u> </u>	2	<u>3X</u>
			4	<u> </u>

ORIGINATOR:

CHECKER:

Charles C. Simpson 7-8-93
C. C. Simpson, Electrical Engineer Date

A. Larsen 7-9-93
A. Larsen, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

7-13-93
Date

JUL 15 1993

SECTION 16100
 ELECTRICAL INSTALLATION
 B-595-C-B210A-16100

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SECTION 16100 ELECTRICAL INSTALLATION

PART 1 GENERAL

1.1 SUMMARY

- 1.1.1 This specification defines the technical requirements for installation of electrical materials and devices in the Vitrification Building foundation.
- 1.1.2 Seller shall furnish all labor, material, tools, and equipment necessary to perform installation of wall embedments, underground duct banks and grounding system for the Vitrification Building foundation package as shown on the Contract Drawings and in accordance with the requirements of this section.
- 1.1.3 Seller shall be responsible for electrical installation and field routing of conduit and grounding system where not specifically defined on the Contract Drawings.
- 1.1.4 Seller shall provide and install locknuts, union fittings, caps, plugs, and hardware, etc., as required to complete the installation per the Contract Drawings.
- 1.1.5 Dimensional tolerance shall be ± 1 inch unless otherwise specified on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM)

ASTM D 2855	1990 Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride, PVC Pipe and Fittings
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1990 National Electrical Code (NEC)
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1.3 RELATED REQUIREMENTS

Specification Section 16110	Electrical Materials and Devices
Specification Section 16111	Conduit Schedule
Specification Section 16905	Electrical Testing

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

1.6.1 Submit the following in accordance with the Vendor Drawing and Data Requirements section of the subcontract.

A. As-Built Drawings

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

A. Site Elevation 714 feet above sea level

B. Barometric Pressure 14.3 psia

C. Outside Design Temperature

1) Maximum Design Temperature 110°F

2) Minimum Design Temperature -20°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Seller shall install all materials including grounding system, underground duct banks, wall embeds and conduit stub-ups required to complete electrical installation in accordance with the Contract Drawings and specification sections.

2.1.2 Electrical material and devices shall be in accordance with Specification Section 16110, Electrical Materials and Devices.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

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PART 3 EXECUTION

3.1 INSTALLATION, APPLICATION AND ERECTION

3.1.1 Materials and devices shall be installed in accordance with the National Electrical Code, NFPA 70, all applicable federal, state and local codes, regulations and ordinances, the Contract Drawings and manufacturer's instructions.

3.1.2 Conduit

3.1.2.1 Conduits installed below grade shall be polyvinyl chloride (PVC) Schedule 80 or rigid steel galvanized conduit as noted on the Contract Drawings.

3.1.2.2 Rigid galvanized steel conduit shall be cut square with a conduit cutter and threaded with a conduit threader. The ends shall be reamed of burrs and all metal shavings and cutting lubricants shall be removed before the conduit is connected to the conduit system.

3.1.2.3 Stainless steel conduits shall be cut square with a conduit cutter.

3.1.2.4 Electrical embeds shall be stainless steel conduit.

3.1.2.5 Conduit crushed or deformed in bending will be rejected. Concentric bends are not required; however, the Seller shall maintain identical spacing between adjacent conduit runs both at the beginning and after the bend.

3.1.2.6 Supports shall be erected square, and true to line and grade, with a minimum of one support for every 10 feet of conduit length.

3.1.2.7 Conduit openings into which dirt, mortar mix or debris may fall shall be closed with caps or plugs during the construction period. Conduits in which such material has accumulated shall be thoroughly cleaned. Where such accumulations cannot be readily removed, the conduit shall be replaced.

3.1.2.8 When not shown in detail on the Contract Drawings or when an installation interference exists, the exact locations and routing of conduit shall be determined by the Seller and approved by the Buyer.

3.1.2.9 Fittings on conduit systems having threaded connections shall be made up tight, with full thread engagement, and with a minimum of wrench work in order to avoid wrench cuts. Running threads and slip joints are not permitted. Joints shall provide structural rigidity and low electrical resistance.

3.1.2.10 Before making up conduit runs, the interiors of all conduit, conduit bends and fittings shall be inspected and cleaned of all dirt, cuttings and other foreign material.

3.1.2.11 Deleted.

3.1.2.12 Rigid galvanized steel conduit threads shall have anti-seize compound. The application of the coating shall overlap the unthreaded conduit by one inch minimum all around.

3.1.2.13 Wall embedded conduits shall be installed with the largest symmetrical bending radius permitted as noted on the Contract Drawings. The entry and exit conduit penetrations shall be 90°/perpendicular to the wall.

3.1.2.14 Installation procedures for making PVC conduit joints, using PVC primer and solvent cement, shall be in accordance with ASTM D 2855.

3.1.3 Conduit and Hardware Supports

3.1.3.1 Conduit supports shall be furnished and installed by the Seller as required by National Electrical Code and as shown on the Contract Drawings.

3.1.4 Deleted.

3.1.4.1 Deleted.

3.1.4.1.1 Deleted.

3.1.4.1.2 Deleted.

3.1.5 Grounding

3.1.5.1 The grounding system including underground duct banks, ground rods, embedded ground plates, instrument test ground, etc., shall be in accordance with the Contract Drawings. In addition to the grounding specified herein or on the Contract Drawings, all ground connections required by the National Electrical Code shall be furnished and installed.

3.1.5.2 Grounding conductors shall be copper. Routing shall be as shown on the Contract Drawings.

3.1.5.3 Before connections are made, all contact surfaces shall be clean of grease, dirt and debris. Apply approved anti-oxidizing compound as specified in Section 16110 to clean contact surfaces connections.

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3.1.5.4 Exothermic weld connections shall be made by the Cadweld process or equal. Grounding connections shall include but not be limited to, all cable to cable splices, tees, X's, cable to ground rods, copper to steel or cast iron and cable lug terminations as shown on the Contract Drawings.

3.1.5.5 Building rebar shall be grounded as shown on the Contract Drawings.

3.1.5.6 Grounding cables shall be protected against mechanical damage before and during backfill. Backfill material within 1'-0" of cables shall not contain rocks larger than 2" in diameter.

| 3.1.6 Instrument Test Grounding

| 3.1.6.1 Instrument test grounding shall be a separate and isolated grounding system. The insulated copper conductor shall be run in PVC conduit and stubup shall be in rigid steel conduit. Routing shall be as shown on the Contract Drawings.

3.1.7 Underground Duct Banks

| 3.1.7.1 Underground duct banks shall consist of rigid galvanized steel conduit, PVC conduit and ground wire encased in concrete as shown on the Contract Drawings. Joints in conduit shall be water-tight.

3.1.7.2 Minimum depth to top of duct banks shall be 2'-6" except as noted on the Contract Drawings.

3.1.7.3 After underground conduit runs have been completed, pull a test mandrel and wire brush through each conduit to check alignment and remove foreign matter.

3.2 FIELD QUALITY CONTROL

Electrical materials and devices shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

3.3 ADJUSTMENTS

(Not Used)

3.4 CLEANING

3.4.1 Clean and remove all debris, excess material and equipment from the job site after completion of installation.

3.4.2 Clean electrical parts with approved cleaner to remove conductive and deleterious materials.

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- 3.4.3 Clean and repair all steel surfaces damaged during preparation, welding or installation with an approved galvanizing compound in accordance with manufacturer's recommendations and instructions.

3.5 PROTECTION

- 3.5.1 Seller shall be responsible for receiving, storing and site handling of all Seller furnished equipment and materials.

- 3.5.2 During installation Seller shall protect from damage all existing facilities, equipment and materials. Existing facilities, equipment or materials which are damaged during the installation shall be repaired at Seller's expense in accordance with contract terms and conditions.

- 3.5.3 Where the corrosion protective finish on any material or equipment is removed by machining, welding, or by accident, the original finish shall be restored by an application of compatible protective finish.

3.6 DEMONSTRATION

(Not Used)

3.7 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 16110
ELECTRICAL MATERIALS AND DEVICES
B-595-C-B210A-16110

APPROVED FOR CONSTRUCTION

REVISION 2 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u> </u>	II	<u>X</u>
SAFETY CLASS	1	<u> </u>	2	<u>3X</u>
			4	<u> </u>

ORIGINATOR:

CHECKER:

Charles C. Simpson 7-8-93
C. C. Simpson, Electrical Engineer Date

A. Larsen 7-9-93
A. Larsen, Electrical Engineer Date

APPROVED BY:

K. A. Owrey
K. A. Owrey Lead Discipline Engineer

7-13-93
Date

JUL 15 1993

SECTION 16110
 ELECTRICAL MATERIALS AND DEVICES
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SECTION 16110
ELECTRICAL MATERIALS AND DEVICES

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the technical requirements for furnishing and delivery of electrical materials and devices for the Vitrification Building foundation.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.1 1990 Rigid Steel Conduit

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A312/A312M 1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes

ASTM A403/A403M 1991 Standard Specification for Wrought Austenitic Stainless Steel Pipe Fittings

ASTM B3 1990 Standard Specification for Soft or Annealed Copper Wire

ASTM B8 1990 Standard Specification for Concentric-Lay-Standard Copper Conductors, Hard, Medium-Hard or Soft

ASTM D 2564 1991 Standard Specification for Solvent Cement for Polyvinyl Chloride, PVC Plastic Pipe and Fittings

ASTM F 656 1989 Standard Specification for Primers for Use in Solvent Cement Joints of Polyvinyl Chloride, PVC Plastic Pipe and Fittings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 1990 National Electrical Code (NEC)

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UNDERWRITERS LABORATORIES, INC. (UL)

UL 467 1984 Grounding and Bonding Equipment
UL 514B 1989 Fittings for Conduit and Outlet
 Boxes
UL 651 1989 Schedule 40 and 80 Rigid PVC Conduit

1.3 RELATED REQUIREMENTS

Specification Section 16100 Electrical Installation
Specification Section 16111 Conduit Schedule
Specification Section 16905 Electrical Testing

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Catalog and Manufacturer's Data

Catalog and manufacturer's data shall be submitted for the following:

- A. Conduit
- B. Conduit fittings
- C. Conduit support devices and hardware
- D. Deleted.
- E. Grounding materials
- F. Conduit anti-seize compounds
- G. Anti-oxidizing compound
- H. Galvanizing touch-up material

I. PVC primer and solvent cement

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

1.8.1 Climatic and Geographic Site Conditions

- A. Site Elevation 714 feet above sea level
- B. Barometric Pressure 14.3 psia
- C. Outside Design Temperature
 - 1) Maximum Design Temperature 110°F
 - 2) Minimum Design Temperature -20°F

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 General

2.1.1.1 When applicable, all electrical materials and components shall be listed by Underwriter's Laboratories and shall bear the UL label.

2.1.1.2 When two or more components of the same specifications are required, the components shall be identical, that is same manufacturer and catalog number.

2.1.2 Conduit

2.1.2.1 Rigid Steel Conduit

Rigid steel conduit shall be in accordance with ANSI C80.1.

2.1.2.2 PVC Conduit

PVC conduit shall be Schedule 80 in accordance with UL 651.

2.1.2.3 Stainless Steel Conduit

2.1.2.3.1 Austenitic seamless stainless steel conduit shall be Type 304L Schedule 40 in accordance with ASTM A312/A312M.

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2.1.3 Conduit Fittings

2.1.3.1 Stainless steel conduit ends shall be protected by means of a plastic or 300 series stainless plug or cap.

2.1.3.2 Rigid steel conduit caps and recessed plugs shall be galvanized steel.

2.1.3.3 Conduit union fittings shall be steel, 1/2 inch - 1 inch or steel alloy 1-1/4 inch - 6 inch, with zinc-electroplated finish and in accordance with UL 514B. Appleton UNY and UNF or equal.

2.1.3.4 Weld fittings for stainless steel conduit shall be in accordance with ASTM A403/A403M.

2.1.4 Conduit Support Devices and Hardware

2.1.4.1 Conduit supports unless otherwise noted on the Contract Drawings shall be fabricated of 12 gauge, 1-5/8 inch by 1-5/8 inch, metal framing channels: Unistrut P-1000, pre-dipped galvanized, with Unistrut P-1000 series, electrogalvanized, pipe clamps or equal.

2.1.4.2 Conduit clamps shall be malleable iron type with hot-dipped galvanized finish. Appleton Series PC or equal.

| 2.1.5 Deleted.

| 2.1.5.1 Deleted.

2.1.6 Grounding Materials

2.1.6.1 Grounding Conductors

2.1.6.1.1 External building ground loop and bonded connections shall be #500 kcmil bare copper wire in accordance with ASTM B3. Wire shall be Class B concentric stranded in accordance with ASTM B8.

2.1.6.1.2 Internal building ground and bonded connections shall be bare copper wire in accordance with ASTM B3 and sized as indicated on the Contract Drawings. Wire shall be Class B concentric stranded in accordance with ASTM B8.

| 2.1.6.1.3 Instrument test ground conductor shall be single conductor, stranded copper wire with green Type TW 600 volt insulation. Conductor shall be UL listed, in accordance with the National Electrical Code, NFPA 70 and sized as indicated on the Contract Drawings.

2.1.6.2 Ground Rods

Ground rods shall be copper clad steel, 5/8 inch diameter by 10 feet: Joslyn Number J8340 or equal.

2.1.6.3 Embedded Ground Plates

2.1.6.3.1 Embedded ground plates shall be cast copper alloy body, four holes type and in accordance with UL 467. Cadweld Catalog Number B161-2Q or equal.

2.1.6.4 Ground Connections

2.1.6.4.1 Weld connections between ground conductors or between ground conductors to steel surfaces shall be by the exothermic process type. Cadweld or equal.

2.1.6.4.2 Ground connections to embedded ground plates shall be made with exothermic connection, Cadweld Type TA or equal as shown on the Contract Drawings.

2.1.6.4.3 Ground wells shall be in accordance with the Contract Drawings.

2.1.7 Conduit Anti-Seize Compounds

Anti-seize compounds for threads of rigid steel conduit shall be electrically conductive: Thomas and Betts Co. "Kopr-Shield" or equal.

2.1.8 Anti-Oxidizing Compound

Anti-oxidizing compound for connections of grounding connectors shall be electrically conductive, rust and corrosion inhibitive, Thomas and Betts "Kopr-Shield" or equal.

2.1.9 PVC Primer and Solvent Cement

PVC primer and solvent cement used for making PVC conduit joints shall be in accordance with ASTM F 656 and ASTM D 2565, respectively. Carlon primer/cement or equal.

2.2 FABRICATION AND MANUFACTURE

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

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3.2 INSTALLATION, APPLICATION AND ERECTION

Materials and devices specified herein shall be installed in accordance with Specification Section 16100, Electrical Installation.

3.3 FIELD QUALITY CONTROL

Materials and devices specified herein shall be inspected and tested in accordance with Specification Section 16905, Electrical Testing.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 15250
VITRIFICATION BUILDING FOUNDATION
MECHANICAL INSULATION
B-595-C-B210A-15250

APPROVED FOR CONSTRUCTION

REVISION
ISSUE DATE 7/14/93

WAPA	YES	___	NO	___
QUALITY LEVEL	I	___	II	___
SAFETY CLASS	1	___	2	___
	3	___	4	___

ORIGINATOR:

CHECKER:

Rod Wright 7/12/93
Rod Wright, Pip. Material Engineer Date

Cliff Johnson 7/12/93
Cliff Johnson, Piping Material Engr. Date

APPROVED BY:

George Barauskas For George Barauskas
George Barauskas Lead Discipline Engineer

7-12-93
Date

JUL 15 1993

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SECTION 15250
VITRIFICATION BUILDING FOUNDATION
MECHANICAL INSULATION
B-595-C-B210A-15250

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	INSULATION CONSTRUCTION DETAILS

SECTION 15250
VITRIFICATION BUILDING FOUNDATION
MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

This specification covers the requirements for the purchasing, fabrication, and application of insulation for piping.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 312/A 312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM C 195	1990 Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C 533	1985 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 552	1988 Standard Specification for Cellular Glass Thermal Insulation
ASTM C 585	1990 Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
ASTM C 795	1989 Wicking-Type Thermal Insulation for Use Over Austenitic Stainless Steel
ASTM E 84	1989 (Rev. A) Standard Test Method for Surface Burning Characteristics of Building Materials

1.3 RELATED REQUIREMENTS

Drawing H-2-124091 Sheet 1	Piping Vit Building Standard Fabrication Details
----------------------------	--------------------------------------------------

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1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

1.5.1 Design/Performance Requirements

- A. Insulation is to be provided for heat conservation and process control.
- B. Insulation symbols as shown on the contract drawings are defined as follows:

<u>Insulation Symbol</u>	<u>Description</u>
IH	Hot insulation - for heat conservation and process control

1.6 SUBMITTALS

Submit the following in accordance Part III, Section I, Exhibit 5, of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 Product Data

- A. One sample of each type of pipe cover insulation and removable cover insulation to be used.
- B. Manufacturer's data sheets for each type of insulation and accessory material to be used.

1.6.2 Manufacturer's instructions, covering handling, installation, storage and maintenance.

1.7 CLASSIFICATION OF SYSTEM AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

- 2.1.1 Insulation thicknesses shall be one inch (1") for all piping, unless shown otherwise on the Drawings.
- 2.1.2 Insulation materials shall have surface burning characteristics as determined by ASTM E 84 not to exceed 20 for flame spread and 50 for smoke developed.
- 2.1.3 All insulation shall conform to ASTM C 795.

2.1.4 Pipe Insulation

Dimensions of all pipe covers shall conform to ASTM C 585.

2.1.5 Insulation for Embedded Piping

- A. Insulation supports for embedded piping shall be Cellular Glass per ASTM C 552. Pittsburgh Corning "Foamglas" or approved equal.
- B. Insulation for fittings and straight runs of pipe shall be fiberglass material per ASTM C 195. Pittsburgh Corning "Temp-Mat" or approved equal.
- C. Insulation for pipe Anchors shall be high compressive strength calcium silicate per ASTM C 533 designed in accordance with Attachment A. Manville Marinite or approved equal.

2.1.6 Jacketing and Securement for Embedded Piping

- A. Jacketing shall be Stainless Steel Pipe, ASTM A 312/312M, Grade 304 Schedule 5S.
- B. .016" thick (27 Gauge), type 304 stainless steel bands for metal jacket.
- C. Minimum 6" wide x .015" thick, type 304 stainless steel sheet.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Packaging and Shipping

Preparation for shipment shall conform to the manufacturer's standard, as a minimum shall provide protection against weathering, and damage from normal handling and storage.

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PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION APPLICATION AND ERECTION

3.2.1 General

- A. Piping shall be insulated where indicated on the Contract Drawings and Documents.
- B. Insulation materials shall be kept dry and shall not be applied wet. If materials become wet after application, they shall be dried or replaced before proceeding with application of jacketing or weatherproofing compound.
- C. Pressure tests, shall, if possible, be completed before insulation is installed. If insulation is applied before testing, all joints shall be left uninsulated and exposed until completion of testing. Shop welds may be insulated prior to field test if the piping has been tested in the shop.

3.2.2 Application - Embedded Insulation

- A. Straight runs of stainless steel jacketing shall be joined together, using stainless steel sheet and bands, as specified in Attachment A.
- B. Assembly of jacketing around elbows, bends, and fittings shall be joined together using tack welds as specified in Attachment A, details #1 & #2.
- C. If required for ease of installation, straight runs of fiberglass insulation may be secured to pipe using 16 gauge wire prior to installation of jacket. Seller may adjust wiring centers and wiring tension to compress insulation sufficiently to allow insertion of insulated pipe into jacketing.
- D. Installation of fiberglass insulation around bends and elbows shall be cut to fit during assembly.
- E. Pipe supports shall be 6" wide full circumferential sections of cellular glass. The sections are to be cut such that a 1/8" clearance is maintained between the outside diameter of the insulation and the inside diameter of the insulation jacketing. The clearance between the outside diameter of the pipe and the inside diameter of the

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insulation shall be per ASTM C 585. Support spacing shall be a maximum of 10 feet where locations are not shown on isometric drawings. Refer to Attachment A, Part 4.

- F. If required for ease of installation, the insulation jacketing elbows may be cut in half longitudinally and closed using tack welds.

3.3 FIELD QUALITY CONTROL

The installed insulation system shall be inspected by Seller for conformance with this specification, pertinent drawings, and Manufacturer's installation procedures. Areas to be included in the inspection are, but not limited to :

- A. Surface to be insulated is free of all moisture, grease and other foreign material.
- B. Correct insulation extent, type and thickness installed.
- C. Installed insulation and jacketing is dry and undamaged. Bands and all securing devices are spaced according to the specified limits.
- D. Storage, handling, and application of jacketing is per this specification section.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

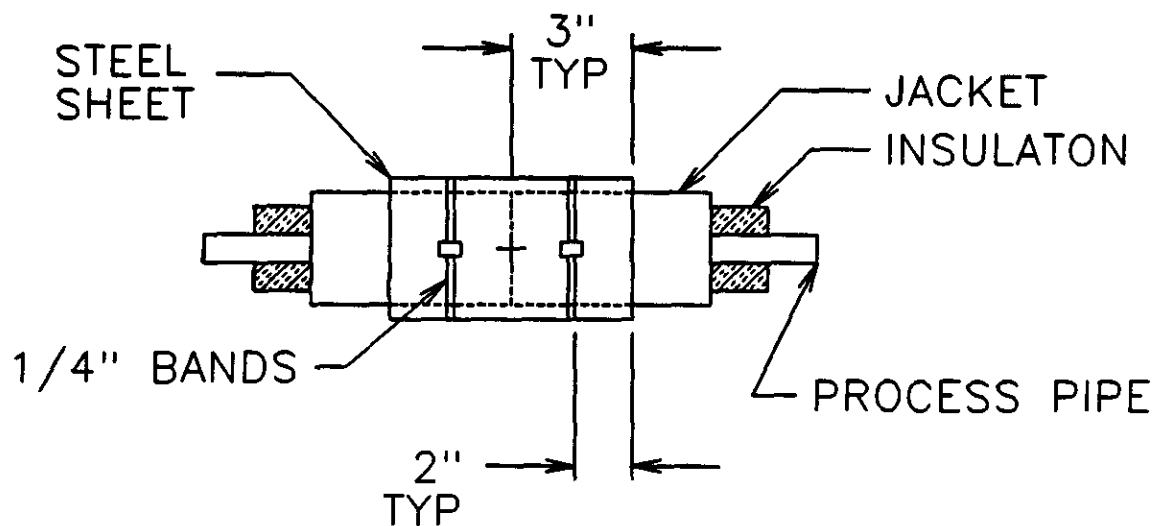
3.8 SCHEDULES

(Not Used)

END OF SECTION

ATTACHMENT A
INSULATION CONSTRUCTION DETAILS

1.0 BANDING OF STAINLESS STEEL JACKET



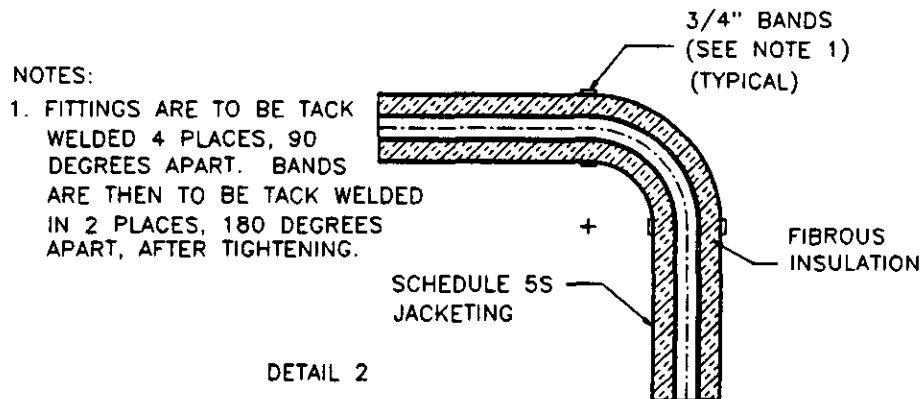
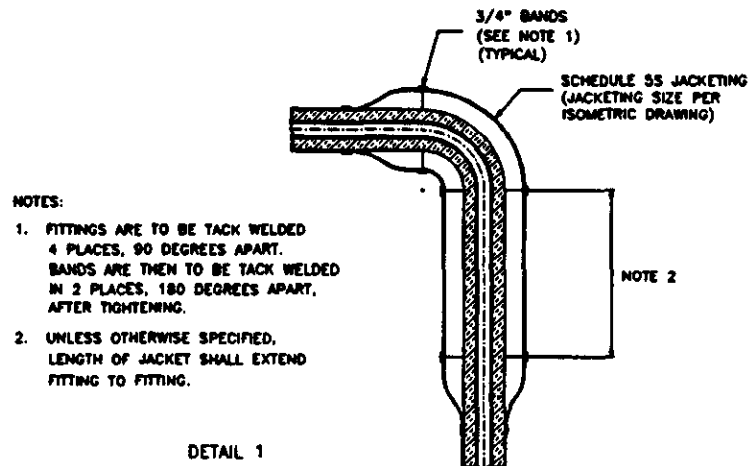
Installation dimensions shown are minimum dimensions.

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2.0 JACKETING CONSTRUCTION DETAILS FOR ELBOWS

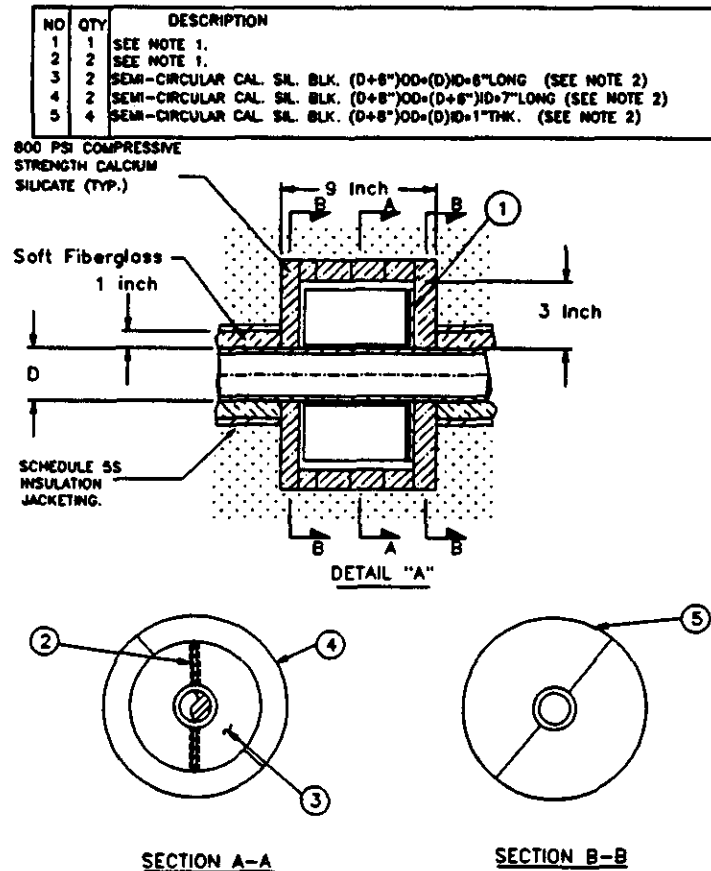


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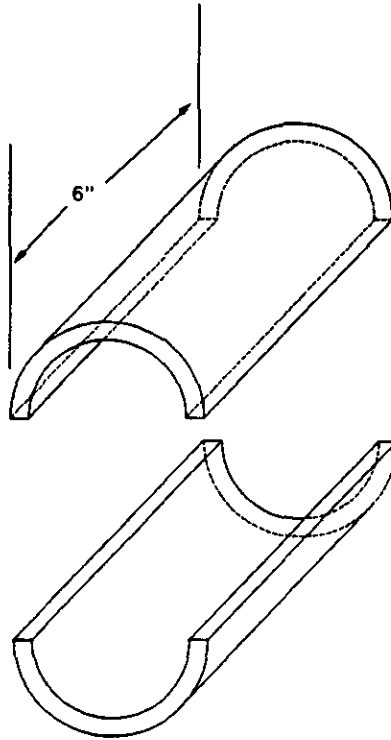
3.0 JACKETING CONSTRUCTION DETAILS FOR ANCHORS



NOTES:

1. STEEL PLATE PORTION OF ANCHOR IS SHOWN FOR REFERENCE ONLY. REFER TO DRAWING M-2-124091, SHEET 1.
2. INSULATION SHALL BE CALCIUM SILICATE WITH A COMPRESSIVE STRENGTH OF 800 PSI MINIMUM. ITEMS 3 AND 4 SHALL BE CUT AND/OR FABRICATED FROM MULTIPLE PANELS IF REQUIRED TO MAKE UP THE SPECIFIED LENGTH.
3. CALCIUM SILICATE DIMENSIONS SHOWN ARE NOMINAL, TO BE FIELD ADJUSTED TO PROVIDE SNUG ENOUGH FIT AROUND ANCHOR SIA2 SUCH THAT MAXIMUM POSSIBLE LONGITUDINAL ANCHOR MOVEMENT IS LESS THAN 1/8".

4.0 RIGID INSULATION PIPE SUPPORT



USE TWO SECTIONS OF CELLULAR GLASS INSULATION TO PROVIDE SUPPORT.
SUPPORT LOCATIONS ARE DETAILED ON THE PIPING ISOMETRIC DRAWINGS.

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SECTION 15062B
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (DOUBLE CONTAINED PIPING)
B-595-C-B210A-15062B

APPROVED FOR CONSTRUCTION

REVISION
ISSUE DATE 7/14/93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	<u>X</u>
			3	___
			4	___

ORIGINATOR:

Rod Wright
Rod Wright, Piping Engineer
7/12/93
Date

CHECKER:

Cliff Johnson
Cliff Johnson, Piping Engineer
7/12/93
Date

APPROVED BY:

George Barauskas
George Barauskas
Lead Discipline Engineer

7-12-93
Date

JUL 15 1993

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SECTION 15062B
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (DOUBLE CONTAINED PIPING)
B-595-C-B210A-15062B

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ATTACHMENTS

ATTACHMENT TITLE

A UNDERGROUND PIPE DETAILS

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SECTION 15062B
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (DOUBLE CONTAINED PIPING)

PART 1 GENERAL

1.1 SUMMARY

This Section defines the technical requirements for the furnishing, fabrication, erection and testing of Double Contained Piping.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI B16.9	1986 Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.3	1990 Chemical Plant and Petroleum Refinery Piping, Including Addenda a and b

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 182/A 182M	1990 Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High- Temperature Service
ASTM A 193/A 193M	1990 Standard Specification for Alloy Steel and Stainless Steel Bolting Material for High-Temperature Service
ASTM A 194/A 194M	1990 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High- Pressure and High-Temperature Service
ASTM A 234/A 234M	1990 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A 240	1991 Standard Specification for Heat- Resisting Chromium and Chromium- Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

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ASTM A 262	1986 Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A 312/A 312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 403/A 403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)	
NACE RP02-74	1974 High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

PIPE FABRICATION INSTITUTE (PFI)

PFI Standard ES-3	1990 Fabricating Tolerances
PFI Standard ES-24	1990 Pipe Bending Methods, Tolerances, Process and Material Requirements
PFI Standard ES-32	1985 Tool Calibration

1.3 RELATED REQUIREMENTS

This specification is to be used in conjunction with the following specifications:

Specification Section 05062	Welding Piping
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 DEFINITIONS

The term "erection," where used in this specification, shall be defined as follows: Shop or field fabricated erection - the placing of any pipe or component of a piping or instrument system in its final position specified in the drawings and/or specifications.

1.5 SYSTEM DESCRIPTION

All components, fabrication, erection, and testing, except as otherwise qualified herein, shall be in accordance with the requirements of ASME B31.3.

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1.6 SUBMITTALS

Submit the following in accordance with Part III, Section I, Exhibit 5 of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 Shop Drawings

Submit shop drawings of nonstandard components per Paragraph 2.1.3B.

1.6.2 Quality Control Submittals

A. Factory Acceptance Tests (FATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit corrosion test reports for each heat per Note 2 of Piping Material Classes DD and DE.

B. Construction Acceptance Tests (CATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit Pressure Test Reports per Paragraph 3.3.4.
- 2) Submit cleaning reports per Paragraph 3.5.3.

1.6.3 Certificates

Certified Material Test Reports (CMTRs) for all pressure containing and/or wetted parts.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

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PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

2.1.1 Piping Material Classes

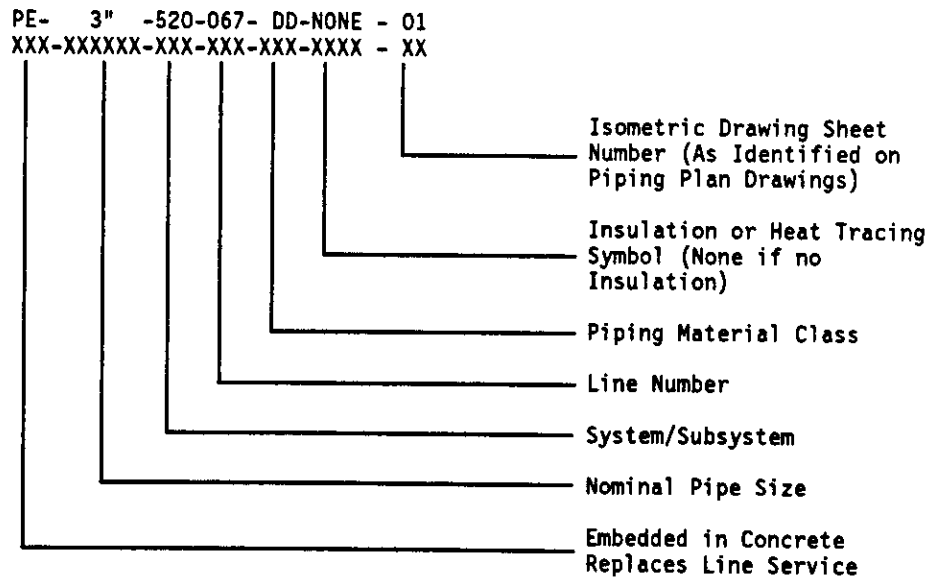
- A. Piping Material Classes are listed herein conform to designations as shown on the drawings.
- B. Unless otherwise specified, all pressures and temperatures listed are design conditions.

C. Piping Material Classes/Services Index

CLASS	MATERIAL	RATING CLASS	SERVICE
DD	Carrier - 304L SS Containment - 304L SS	300 300	Process Regulated Drains
DE	Carrier - 316L SS Containment - 316L SS	300 300	Process Regulated Drains (Formic Acid Drains) 90% Formic Acid
DH	Carrier - 304L SS Containment - 304L SS	3000 PSIG @ 150°F	Hydraulic Oil Nitrogen

D. Identification of Piping

Example:



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Piping Material Class DD

General Material: Carrier and Containment - 304L Stainless Steel
Rating: Carrier - Class 300
Containment - Class 300
Temperature Limit: -20°F thru 450°F
Maximum Pressure: 260 PSIG
Corrosion Allowance: Carrier - .065" (See Note 3)
Containment - None
Construction: Carrier and Containment - Buttweld (except socketweld connections to containment drains)

ITEM DESCRIPTION

Carrier and Containment Pipe (See Note 2)

2" - 8" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.

Carrier and Containment Fittings (ells, tees, laterals, caps, and reducers, See Notes 1 and 2)

2" - 8" Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, schedule 40S.

Containment Self Reinforced Branch Connections

1/2" - 2" Class 3000 stainless steel, ASTM A 182/A 182M, Grade F304L, socketweld. Bonney Forge Sockolet or equal.

Carrier Branch Construction

Use reducing tees or reducing laterals within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Containment Branch Construction

Use reducing tees or reducing laterals (split and reweld to suit) within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals (split and reweld to suit) and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Carrier Swages

2" - 2" Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP304L-S, schedule 40S, beveled both ends.

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Piping Material Class DD (continued)

Flanges (See Note 4)

2" - 8" Plate flange, ASTM A 240, 304L stainless steel flat face slip-on type, 1/4" thick. Flange drilling to match that of ASME/ANSI B16.5 Class 150 flange.

2" - 8" Plate blind flange, ASTM A 240, 304L stainless steel flat face slip-on type, 1/4" thick. Flange drilling to match that of ASME/ANSI B16.5 Class 150 blind flange.

Gaskets (See Note 4)

2" - 8" Class 125 full face red rubber gasket, 1/8" thick. Sepco 20 or equal.

Bolts (See Note 4)

Stud bolts, 304 stainless steel, ASTM A 193, Grade B8 with ASTM A 194 Grade 8S nuts.

Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 304L stainless steel plate.

Notes:

1. Use bends with a radius of 3 nominal pipe diameters (3D) on carrier piping for sizes 2", and fittings on containment piping except where indicated otherwise on the drawings.
2. Deleted.
3. All embedded lines have been checked to ensure an available corrosion allowance of .120 inch minimum on the carrier pipe. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of .120 inch on the carrier pipe.
4. Use these items only at cleanouts for drain lines.

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Piping Material Class DE

General Material: Carrier and Containment - 316L Stainless Steel
Rating: Carrier - Class 300
Containment - Class 300
Temperature Limit: -20°F thru 450°F
Maximum Pressure: 260 PSIG
Corrosion Allowance: Carrier - .065" (See Note 3)
Containment - None
Construction: Carrier and Containment - Buttweld (except socketweld connections to containment drains)

ITEM DESCRIPTION

Carrier and Containment Pipe (See Note 2)

2" - 8" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP316L, beveled ends.

Carrier and Containment Fittings (ells, tees, caps, and reducers, See Notes 1 and 2)

2" - 8" Stainless steel, ASTM A 403/A 403M, Grade WP316L-S, buttweld type, schedule 40S.

Containment Self Reinforced Branch Connections

1/2" - 2" Class 3000 stainless steel, ASTM A 182/A 182M, Grade F316L, socketweld. Bonney Forge Sockolet or equal.

Carrier Branch Construction

Use reducing tees or reducing laterals within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Containment Branch Construction

Use reducing tees or reducing laterals (split and reweld to suit) within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals (split and reweld to suit) and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Carrier Swages

2" - 2" Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP316L-S, schedule 40S, beveled both ends.

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Piping Material Class DE (continued)

Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 316L stainless steel plate.

Flanges (See Note 4)

- | | |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2" - 8" | Plate flange, ASTM A 240, 316L stainless steel flat face slip-on type, 1/4" thick. Flange drilling to match that of ASME/ANSI B16.5 Class 150 flange. |
| 2" - 8" | Plate blind flange, ASTM A 240, 316L stainless steel flat face slip-on type, 1/4" thick. Flange drilling to match that of ASME/ANSI B16.5 Class 150 blind flange. |

Gaskets (See Note 4)

- | | |
|---------|-----------------------------------------------------------------------|
| 2" - 8" | Class 125 full face red rubber gasket, 1/8" thick. Sepco 20 or equal. |
|---------|-----------------------------------------------------------------------|

Bolts (See Note 4)

Stud bolts, 304 stainless steel, ASTM A 193, Grade B8 with ASTM A 194 Grade 8S nuts.

Notes:

1. Use bends with a radius of 3 nominal pipe diameters (3D) on carrier piping for size 2", and fittings on containment piping except where indicated otherwise on the drawings.
2. Deleted.
3. All embedded lines have been checked to ensure an available corrosion allowance of .120 inch minimum on carrier piping. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of .120 inch on carrier piping.
4. Use these items only at cleanouts for drain lines.

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Piping Material Class DH

General Material: Carrier and Containment - 304L Stainless Steel
Rating: Carrier - 3000 PSIG
Containment - 3000 PSIG
Temperature Limit: -20°F thru 150°F
Maximum Pressure: 3000 PSIG
Corrosion Allowance: Carrier - .03"
Containment - None
Construction: Carrier and Containment - Buttweld

ITEM DESCRIPTION

Carrier and Containment Pipe (See Note 1)

1" - 1"	Seamless stainless steel, schedule 80S, ASTM A 312/A 312M, Grade TP304L, beveled ends.
1" - 1"	Seamless stainless steel, schedule 160, ASTM A 312/A 312M, Grade TP304L, beveled ends. (Use on 3D bends).
1 1/2" - 1 1/2"	Seamless stainless steel, schedule 160, ASTM A 312/A 312M, Grade TP304L, beveled ends.
3" - 3"	Seamless stainless steel, schedule 160, ASTM A 312/A 312M, Grade TP304L, beveled ends.

Containment Fittings

3" - 3"	Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, schedule 160 short radius elbow. (Use as containment for 1" carrier size)
3" - 3"	Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, long radius elbow schedule 160. (Use as containment for 1 1/2" carrier size)

Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 304L stainless steel plate.

Notes:

1. Use bends with a radius of 3 nominal pipe diameters (3D) on carrier piping and fittings on containment piping except where indicated otherwise on the drawings.

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2.1.2 Pressure Testing Materials

A. Test Water Requirements

Water used for cleaning and/or hydrotest shall conform to Specification Section 13252.

B. Pneumatic Air Requirements

The air for pneumatic testing shall have a dew point of -20°F or less at atmospheric pressure and shall contain less than 10 parts per million oil.

C. Leak Detector Solution

Leak detector solution for pneumatic testing shall be Nupro "Snoop" or equal.

D. Pressure Test Blinds

Plain 1/4" thick stainless steel test blanks made from ASTM A 240, Grade TP304 plate with 1/16 inch thick non-asbestos gaskets shall be used for blanking raised face flanges for sizes up to 6 inches.

E. Pressure Test Plugs

Open ends of piping systems (i.e., plain end or beveled end) that cannot otherwise be blanked off for pressure testing shall be closed off with commercial pressure test plugs suitable for the pipe size and test pressure.

2.1.3 Components

A. The requirements contained in this Section shall apply to all Material Classes included in this specification.

B. Pipe, fittings, and all other piping components (i.e., valves, strainers, gaskets, bolting, etc.) shall be standard components conforming to the standards listed in ASME B31.3, Appendix E within the size ranges of those standards. Where such conformance is not possible (i.e., fittings smaller than 1/2" NPS, manufacturer's proprietary design, etc.), the Seller shall submit a dimensional drawing of the component, and the component shall be certified by the manufacturer as being suitable for the design conditions of the applicable material class. The Seller shall adjust field dimensions if the materials procured do not correspond to the dimensions depicted on the drawings.

2.1.4 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 pounds per square inch lengthwise and 150 pounds per square inch crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be as specified in Table 1 and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 1

TAPE COLOR

Red: Gas, Oil, Dangerous Materials

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in the trench backfill.

2.1.5 Corrosion Control Materials for Underground Pipe

- A. Cold Applied Tape Wrap system shall consist of a tape manufacturer recommended primer and a Nomex or equal base cloth and phenolic base resin, and shall be suitable for operation at 340°F. Knight-Laggi 200 System or equal.
- B. High Temperature Cement for packing of voids and repair of coating at exothermic welds shall be a matrix composed primer and chopped fibers of the tape base cloth.
- C. Magnesium ribbon anode shall consist of .135" diameter core wire coated with magnesium in a 3/8" x 3/4" rectangular shape, with a nominal weight of 0.243 pounds per foot. Dow DC-1016 Galvoline or approved equal.
- D. 12 gauge wire for test leads and jumper wire shall be suitable for direct burial, with Type RHW insulation.

2.1.6 Corrosion Evaluated Material (CEM) Requirements

- A. Piping lines requiring CEM material are indicated by notes on the piping Contract Drawings and on the line list.
- B. Type 304L SS material shall be corrosion tested per ASTM A262, Practice C when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.002 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- C. Type 316L SS material shall be corrosion tested per ASTM A262, Practice B when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.004 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- D. Hastelloy C-22 material shall be corrosion tested per ASTM G28, Practice B when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be measured corrosion rate of less than 0.0008 inches/month. A Certified Material Test Report (CMTR) with the above corrosion testing requirement of the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- E. Piping that is fabricated with CEM And is hot-formed or heat-treated may require addition corrosion testing after fabrication depending upon the type of hot-forming or heat-treatment. This may be accomplished by corrosion testing a CEM coupon of the same heat as the piping being fabricated, provided said coupon has been subjected to the same hot-forming or heat-treatment cycle as the finished product. If the coupon does not pass the corrosion test, results will be submitted to the Buyer for evaluation. The entire part may need a solution anneal heat-treatment if the Buyer's evaluation determines that this is required.
- F. Double contained piping only requires CEM for the carrier piping material.
- G. Weld filler metal does not require CEM testing.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Shop Assembly

A. Welding

Welding, weld examination and postweld heat treatment shall be in accordance with Specification Section 05062.

B. Internal Misalignment

Where the ends of piping components are to be joined by welding and the internal surface misalignment exceeds the dimensional limits of the qualified welding procedure, one of the following procedures shall be used to correct this condition.

1) Taper bore or grind the wall of the component extending internally using a 4 to 1 maximum taper. Such tapering shall not result in a finished wall thickness, before welding, that is less than the nominal pipe wall thickness minus the manufacturer's mill tolerance. Further reduction of the wall thickness requires Buyer's authorization.

2) Use spreaders or internal and/or external lineup clamps to correct moderate out-of-round condition.

C. Cleanliness

Cleanliness requirements for fabrication, handling and storage of 300 series stainless steel piping shall be per Specification Section 13252.

D. Any deviations in dimensions from the drawings shall be submitted to the Buyer in writing, for approval, prior to fabrication of the affected piping.

E. Dimensions on the Piping Plan drawings are in inches when dimensions are less than 1'-0". Feet and inches are shown when dimensions are 1'-0" and more. Dimensions on the Piping Isometric drawings are in inches when less than 2 feet. Feet and inches are shown when dimensions are 2 feet or greater.

F. Dimensions are to the centerline of pipe.

G. Where cold spring (CS) or prespring (PS) is required, the Piping drawings have been adjusted to accommodate this. The piping shall be fabricated to the dimensions shown.

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- H. Reducers are concentric (except for slurry services) unless otherwise noted on the drawings.

2.2.2 Fabrication - Dimensional Tolerances

Pipe fabrication tolerances shall be in accordance with Pipe Fabrication Institute ES-3.

2.2.3 Fabrication - Pipe Bending

- A. Pipe bending shall be in accordance with Pipe Fabrication Institute ES-24. Except, pipe bend post wall thickness shall be no less than 78.1 percent of the pre-bend thickness.
- B. When three diameter bends "3D" are referenced, they are to be fabricated in accordance with the 3D requirements. (The requirements for 3Dn are not to be applied under any circumstance.)

2.2.4 Packaging and Shipping

- A. Preparation for shipment shall conform to the manufacturer's standard, and as a minimum shall provide protection against corrosion and damage from normal handling and storage.
- B. Minimum preparation shall include the following:

All pipe ends shall be protected by means of a plastic (non-PVC) or 300 series stainless steel plug or cap.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION APPLICATION AND ERECTION

3.2.1 Field Fabrication and Erection

- A. All field fabrication shall conform to the paragraph titled "Fabrication", except that field installation tolerances shall be plus or minus 1/2".
- B. All piping and tubing shall be fabricated and installed in accordance with the Piping drawings.
- C. Coordinates and elevations are used extensively on the Piping drawings. The Seller shall establish the required fabrication dimensions.

- B. The maximum test pressure shall be the greater of:
 - 1) 1.1 times (1.1x) the minimum test pressure
 - 2) 60 psi greater than the minimum test pressure
- C. Prior to initial operation, all installed piping shall be tested except where otherwise qualified by this specification.
- D. Piping that is to be purged after installation shall be tested and all repairs made prior to purging.
- E. The Buyer's Representative shall be given two working days prior notification of the time and date of any testing to be performed.
- F. The Seller shall prepare and submit a hydrostatic and pneumatic test procedure, including test diagrams, and test report format.

3.3.2 Pressure Testing of Piping

- A. All pressure testing shall be per ASME B31.3.
- B. All piping systems shall be hydrostatically tested (carrier piping).
- C. The annular space of double contained pipe shall be pneumatically tested with air at 10 psig, meeting the requirements of paragraph 2.1.2.B of this specification.

3.3.3 Pressure Test Preparation

- A. All joints, including welds, are to be left uninsulated and exposed for examination during the test. Joints may be insulated or coated once they have been previously tested in accordance with this specification.
- B. Pressure test gauges shall be calibrated per PFI ES-32. The calibration shall be made using a dead weight tester with calibration records traceable to the National Institute of Standards and Technology. Gauge shall be tagged with the dates of the last and next calibrations. The date of the gauge calibration shall be recorded by the Seller.
- C. The Seller shall furnish the pumps, gauges, measuring devices, temporary plug valves, and other miscellaneous equipment necessary for testing.

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- D. The test pressure, minimum duration, and acceptance criteria shall be in accordance ASME B31.3. The following additional requirements shall be included:
- 1) The test pressure shall be applied and maintained for at least five minutes prior to start of minimum test duration to assure that the pressure has equalized.
 - 2) The test pressure shall be maintained for a time sufficient to examine all joints and connections for leakage, but in any case not less than ten minutes. The acceptance criteria is zero leakage.
 - 3) If leaks are found, then
 - their locations shall be marked;
 - the test pressure shall be gradually released;
 - the piping shall be drained;
 - appropriate repairs or replacement shall be made;
 - and the pressure testing shall be repeated until acceptable results have been achieved.

3.3.4 Test Records

The Seller shall prepare and submit to the Buyer test reports for all piping systems requiring tests. The test reports shall contain, as a minimum, the following data:

- A. Job title and Contract Number
- B. Date of test
- C. Contract drawing and line numbers identification of piping systems
- D. Type of test, i.e., Hydrostatic, Pneumatic,
- E. Pressure applied and length of time at Test pressure
- F. Test results
- G. Test by
- H. Signature of Seller Test Supervisor
- I. Comments, if any

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J. Gauge identification and dates of last and next calibration

K. Signature or stamp of the Buyer's Representative

3.4 ADJUSTMENT

(Not Used)

3.5 CLEANING

3.5.1 Cleaning After Hydrotesting

After hydrotesting, the following procedure shall be followed:

- A. Water used in cleaning austenitic stainless steel and other alloy piping shall conform to Specification Section 13252.
- B. Flushing velocity shall not exceed 10 feet per second but shall be a minimum of 4 feet per second.
- C. Piping systems shall be flushed for a minimum of 10 minutes (continuous).
- D. Visual examination of cleanliness shall be by visual examination of a clean white cloth used to filter the system discharge. Additional 10 minute flushes shall be performed until the visual examination reveals no visible debris collection on the cloth.
- E. To ensure the absence of moisture after cleaning, lines shall be drained and blown dry. The drying procedure shall be per Specification 13252.
- F. Immediately after cleaning, drying, and inspection, all non-flanged openings shall be tightly sealed with polyethylene caps to protect the bevel and pipe ends and to prevent the entry of moisture and foreign matter.

3.5.2 Cleaning After Pneumatic Testing

After pneumatic testing, piping shall be purged at a minimum velocity of ten feet per second until no foreign matter is seen exiting the pipe. Air quality shall be that specified per paragraph 2.1.2.B of this specification.

3.5.3 Cleaning Reports

All visual examinations, flushes, and purges shall be documented in a test report to be submitted to the Buyer.

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3.6 PROTECTION

All open ends of piping shall be protected with polyethylene or stainless steel caps or plugs. Open ends of annular spaces of double contained piping shall be protected with polyethylene annular plugs or wrapped with 2 mil or thicker polyethylene sheet.

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULE

(Not Used)

END OF SECTION

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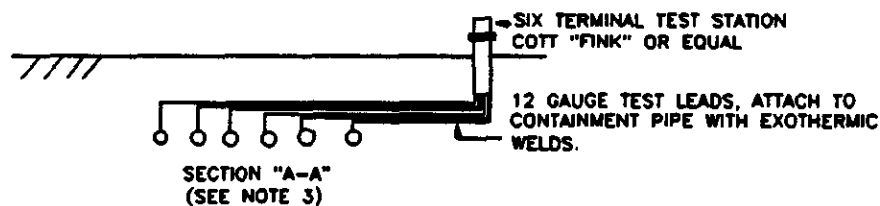
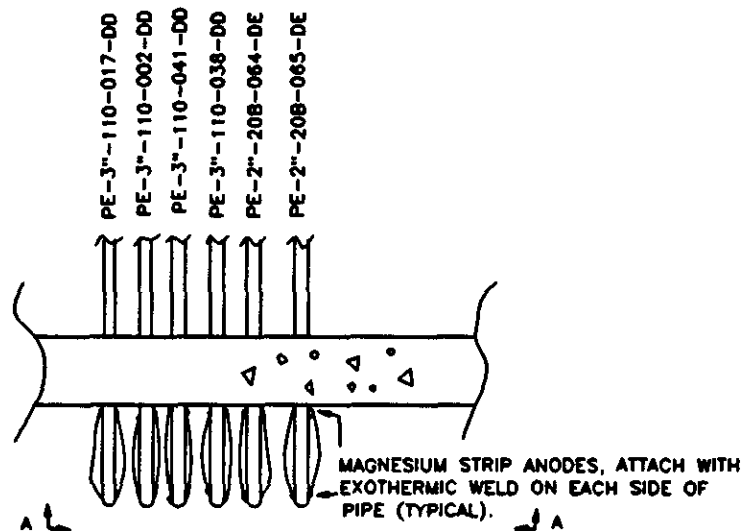
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ATTACHMENT A UNDERGROUND PIPE DETAILS

DETAIL "B"

TEMPORARY CATHODIC PROTECTION DETAIL
FOR LINES LEAVING VITRIFICATION BUILDING SLAB
(SEE NOTES 1 AND 2)

PLAN VIEW



NOTES:

1. COVER EXOTHERMIC WELDS WITH HIGH TEMPERATURE CEMENT PRIOR TO WRAPPING AREA WITH HIGH TEMPERATURE TAPE.
2. REFER TO DETAIL "B" FOR ADDITIONAL REQUIREMENTS APPLICABLE TO INSULATED LINES.
3. LABEL EACH TEST LEAD WITH LINE NUMBER USING COMPUTER PRINTED CHARACTERS ON WHITE HEAT SHRINK SLEEVE, BRADY CATALOG NUMBER 8321 OR EQUAL.

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SECTION 15062A
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (INTRA-AREA TRANSFER LINES)
B-595-C-B210A-15062A

APPROVED FOR CONSTRUCTION

REVISION
ISSUE DATE 7/14/93

WAPA YES NO X
QUALITY LEVEL I X II
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

Cliff Johnson 7/12/93
Cliff Johnson, Piping Engineer Date

Rod Wright 7/12/93
Rod Wright, Piping Engineer Date

APPROVED BY:

George Barauskas for George Barauskas
George Barauskas Lead Discipline Engineer

7-12-93
Date

Note: Lines covered by this Specification Section are currently under hold Number HWVP-FD-240 on the drawings.

JUL 15 1993

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& PRESSURE TESTING (INTRA-AREA TRANSFER LINES)
B-595-C-B210A-15062A

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**SECTION 15062A
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (INTRA-AREA TRANSFER LINES)**

PART 1 GENERAL

1.1 SUMMARY

This Section defines the technical requirements for the furnishing, fabrication, erection and testing of embedded and buried portions of the Intra-Area Transfer lines consisting of the following line numbers:

PE-3"-110-002-DF
PE-3"-110-017-DF
PE-3"-110-038-DF
PE-3"-110-041-DF

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI B16.9	1986 Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.3	1990 Chemical Plant and Petroleum Refinery Piping, Including Addenda a and b

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 182/A 182M	1990 Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High- Temperature Service
ASTM A 234/A 234M	1990 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A 240	1991 Standard Specification for Heat- Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

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ASTM A 312/A 312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 403/A 403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM B 366	1989 Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Welding Fittings
ASTM B 619	1990 Standard Specification for Welded Nickel and Nickel-Cobalt Alloy Pipe
ASTM B 622	Rev. A-1987 Standard Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
ASTM G 28	1985 Detecting Susceptibility to Intergranular Attack to Wrought, Nickel-Rich, Chromium-Bearing Alloys, Test Methods of

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE RP02-74	1974 High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
--------------	------------------------------------------------------------------------------------

PIPE FABRICATION INSTITUTE (PFI)

PFI Standard ES-3	1990 Fabricating Tolerances
PFI Standard ES-32	1985 Tool Calibration

1.3 RELATED REQUIREMENTS

This specification is to be used in conjunction with the following specifications:

Specification Section 05062B	Welding Piping
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

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1.4 DEFINITIONS

The term "erection," where used in this specification, shall be defined as follows: Shop or field fabricated erection - the placing of any pipe or component of a piping or instrument system in its final position specified in the drawings and/or specifications.

1.5 SYSTEM DESCRIPTION

All components, fabrication, erection, and testing, except as otherwise qualified herein, shall be in accordance with the requirements of ASME B31.3.

1.6 SUBMITTALS

Submit the following in accordance with Part III, Section I, Exhibit 5 of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 Shop Drawings

Submit shop drawings of nonstandard components per Paragraph 2.1.3A.

1.6.2 Quality Control Submittals

A. Factory Acceptance Tests (FATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit corrosion test reports for each heat per Note 1 of Piping Material Class DF.

B. Construction Acceptance Tests (CATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit Pressure Test Reports per Paragraph 3.3.4.
- 2) Submit cleaning reports per Paragraph 3.5.3.

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1.6.3 Certificates

Certified Material Test Reports (CMTRs) for all pressure containing and/or wetted parts.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

2.1.1 Piping Material Classes

- A. Piping Material Classes are listed herein conform to designations as shown on the drawings.
- B. Unless otherwise specified, all pressures and temperatures listed are design conditions.
- C. Piping Material Classes/Services Index

CLASS	MATERIAL	RATING CLASS	SERVICE
DF	Carrier - Hastelloy C-22 Containment - 304L SS	300 300	Process

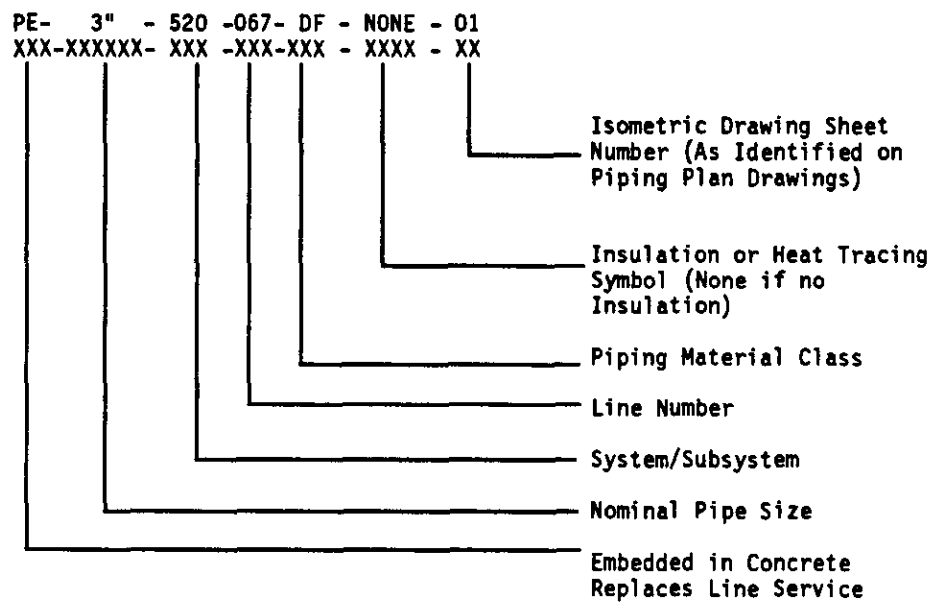
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D. Identification of Piping

Example:



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Piping Material Class DF

General Material: Carrier - Hastelloy C-22
Containment - 304L Stainless Steel
Rating: Carrier - Class 300
Containment - Class 300
Temperature Limit: -20°F thru 450°F
Maximum Pressure: 260 PSIG
Corrosion Allowance: Carrier - .065"
Containment - None
Construction: Carrier and Containment - Buttweld (except socketweld connections to containment drains)

ITEM DESCRIPTION

Carrier Pipe and (See Note 1)

2" - 8" Seamless Hastelloy C-22, Sch 40S, ASTM B 622 Alloy N06022, beveled ends.

Containment Pipe

2" - 8" Seamless stainless steel, Sch 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.

Carrier Fittings (ells, tees, laterals, caps, and reducers)
(See Note 1)

2" - 8" Hastelloy C-22, Buttweld type, Sch 40S, beveled ends, seamless to ASTM B 366, Grade WPHC22-S

Containment Fittings (ells, tees, laterals, caps, and reducers)

2" - 8" Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, Buttweld type, Sch 40S.

Containment Self Reinforced Branch Connections

1/2" - 2" Class 3000 stainless steel, ASTM A 182/A 182M, Grade F304L, socketweld. Bonney Forge Sockolet or equal.

Carrier Branch Construction

Use reducing tees or reducing laterals within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

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Piping Material Class DF (continued)

Containment Branch Construction

Use reducing tees or reducing laterals (split and reweld to suit) within the size range of reducing tees per ASME/ANSI B16.9. Use reducing tees/laterals (split and reweld to suit) and reducers (or swage nipples) where not within the size range of ASME/ANSI B16.9.

Carrier Swages

2" - 2" Concentric swage, Hastelloy C-22, Sch 40S seamless to ASTM B366, Grade WPHC22-S beveled both ends.

Centering Guides

Centering guides shall be made from 1/4" thick ASTM A 240, Grade 304L stainless steel plate.

Notes:

1. Hastelloy C-22 material shall be corrosion tested per ASTM G28, Practice B when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be measured corrosion rate of less than 0.0008 inches/month. A Certified Material Test Report (CMTR) with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
2. Melting Practice for Hastelloy C-22 or equal alloys shall consist of:
 - a. Electric Arc primary melting.
 - b. Argon/Oxygen Decarburization treatment.
 - c. Eelectroslag remelting into final ingot.
3. Alloy composition for Hastelloy C-22 or equal material shall be within the following limits:

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ELEMENT	MINIMUM %	MAXIMUM %
Nickel	Balance	Balance
Chromium	21.00	22.30
Molybdenum	12.90	13.90
Iron	3.10	4.80
Tungsten	2.60	3.40
Carbon		0.010
Phosphorus		0.02
Sulfur		0.010
Silicon		0.08
Cobalt		2.5
Manganese		0.5
Vanadium		0.35

These limits are more stringent than those imposed by the ASTM Specifications.

4. Piping that is fabricated with CEM and is hot-formed or heat-treated may require additional corrosion testing after fabrication depending upon the type of hot-forming or heat-treatment. This may be accomplished by corrosion testing a CEM coupon the same heat as the piping being fabricated, provided said coupon has been subjected to the same hot-forming or heat-treatment cycle as the finished product. If the coupon does not pass the corrosion test, results will be submitted to the Buyer for evaluation. The entire part may need a solution anneal heat-treatment if the Buyer's evaluation determines that this is required.

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2.1.2 Pressure Testing Materials

A. Test Water Requirements

Water used for cleaning and/or hydrotest shall conform to Specification Section 13252.

B. Pneumatic Air Requirements

The air for pneumatic testing shall have a dew point of -20°F or less at atmospheric pressure and shall contain less than 10 parts per million oil.

C. Leak Detector Solution

Leak detector solution for pneumatic testing shall be Nupro "Snoop" or equal.

D. Pressure Test Plugs

Open ends of piping systems (i.e., plain end or beveled end) that cannot otherwise be blanked off for pressure testing shall be closed off with commercial pressure test plugs suitable for the pipe size and test pressure.

2.1.3 Components

General

The requirements contained in this Section shall apply to all Material Classes included in this specification.

A. Pipe, fittings, and all other piping components (i.e., valves, strainers, gaskets, bolting, etc.) shall be standard components conforming to the standards listed in ASME B31.3, Appendix E within the size ranges of those standards. Where such conformance is not possible (i.e., fittings smaller than 1/2" NPS, manufacturer's proprietary design, etc.), the Seller shall submit a dimensional drawing of the component, and the component shall be certified by the manufacturer as being suitable for the design conditions of the applicable material class. The Seller shall adjust field dimensions if the materials procured do not correspond to the dimensions depicted on the drawings.

B. Buttweld fittings shall conform to ASME/ASTM B16.9.

2.1.4 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 pounds per square inch lengthwise and 150 pounds per square inch crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be as specified in Table 1 and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 1
TAPE COLOR

Red: Gas, Oil, Dangerous Materials

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in the trench backfill.

2.1.5 Corrosion Control Materials for Underground Pipe

- A. Cold Applied Tape Wrap system shall consist of a tape manufacturer recommended primer and a Nomex or equal base cloth and phenolic base resin, and shall be suitable for operation at 340°F. Knight-Laggi 200 System or equal.
- B. High Temperature Cement for packing of voids and repair of coating at exothermic welds shall be a matrix composed primer and chopped fibers of the tape base cloth.
- C. Magnesium ribbon anode shall consist of a .135" diameter core wire coated with magnesium in a 3/8" x 3/4" rectangular shape, with a nominal weight of 0.243 pounds per foot. Dow DC-1016 Galvoline or approved equal.
- D. 12 gauge wire for test leads and jumper wire shall be suitable for direct burial, with type RHW insulation.

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2.2 FABRICATION AND MANUFACTURE

2.2.1 Shop Assembly

A. Welding

Welding, weld examination and postweld heat treatment shall be in accordance with Specification Section 05062B.

B. Internal Misalignment

Where the ends of piping components are to be joined by welding and the internal surface misalignment exceeds the dimensional limits of the qualified welding procedure, one of the following procedures shall be used to correct this condition.

- 1) Taper bore or grind the wall of the component extending internally using a 4 to 1 maximum taper. Such tapering shall not result in a finished wall thickness, before welding, that is less than the nominal pipe wall thickness minus the manufacturer's mill tolerance. Further reduction of the wall thickness requires Buyer's authorization.
- 2) Use spreaders or internal and/or external lineup clamps to correct moderate out-of-round condition.

C. Cleanliness

Cleanliness requirements for fabrication, handling and storage of 300 series stainless steel piping shall be per Specification Section 13252.

D. Any deviations in dimensions from the drawings shall be submitted to the Buyer in writing, for approval, prior to fabrication of the affected piping.

E. Dimensions on the Piping Plan drawings are in inches when dimensions are less than 1'-0". Feet and inches are shown when dimensions are 1'-0" and more. Dimensions on the Piping Isometric drawings are in inches when less than 2 feet. Feet and inches are shown when dimensions are 2 feet or greater.

F. Dimensions are to the centerline of pipe.

G. Where cold spring (CS) or prespring (PS) is required, the Piping drawings have been adjusted to accommodate this. The piping shall be fabricated to the dimensions shown.

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- H. Reducers are concentric (except for slurry services) unless otherwise noted on the drawings.

2.2.2 Fabrication - Dimensional Tolerances

Pipe fabrication tolerances shall be in accordance with Pipe Fabrication Institute PFI ES-3.

2.2.3 Packaging and Shipping

- A. Preparation for shipment shall conform to the manufacturer's standard, and as a minimum shall provide protection against corrosion and damage from normal handling and storage.

- B. Minimum preparation shall include the following:

All pipe ends shall be protected by means of a plastic (non-PVC) or 300 series stainless steel plug or cap.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION APPLICATION AND ERECTION

3.2.1 Field Fabrication and Erection

- A. All field fabrication shall conform to the paragraph titled "Fabrication", except that field installation tolerances shall be plus or minus 1/2".
- B. All piping and tubing shall be fabricated and installed in accordance with the Piping drawings.
- C. Coordinates and elevations are used extensively on the Piping drawings. The Seller shall establish the required fabrication dimensions.
- D. Elevations are designated as follows:

Nonsloped lines -	"Bottom of Pipe" (BOP EL _____)
	"Centerline Elevation" (CL EL _____)
	"Beveled End Elevation" (BE EL _____)
	"Plain End Elevation" (PE EL _____)
Sloped lines -	"Centerline Work Point Elevation" (CL W.P. EL _____)

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- E. Piping shall be examined before erection to ensure that all foreign matter has been removed.
- F. The Seller shall be responsible for the proper horizontal and vertical alignment of the piping as shown on the drawings.
- G. The Seller may elect, at his option, to split and reweld secondary containment piping, fittings, anchors, etc.
- H. The Seller shall place buried warning and identification tape conforming to Paragraph 2.1.4 to identify the presence of underground piping at a depth of 12 inches below finished grade or as shown on the Contract Drawings.
- I. Fitting make-up is not dimensioned on the drawings.

3.2.2 Corrosion Protection for Underground Piping

- A. All exposed piping (including stainless steel containment pipe) in underground service shall be protected from exterior corrosion by use of a cold applied tape wrap. Materials, surface preparation, application and inspection requirements shall be in accordance with manufacturer's recommendations.
- B. All buried piping shall be holiday tested, for coating discontinuities, per NACE RP02-74.
- C. Refer to Attachment A for temporary cathodic protection requirements.

3.3 FIELD QUALITY CONTROL

3.3.1 Pressure Tests

- A. The minimum test pressure is the lowest allowable test pressure gauge reading (the calculated test pressure plus the additional pressure resulting from the static head of the test fluid above the test gauge).
- B. The maximum test pressure shall be the greater of:
 - 1) 1.1 times (1.1x) the minimum test pressure
 - 2) 60 psi greater than the minimum test pressure
- C. Prior to initial operation, all installed piping shall be tested except where otherwise qualified by this specification.
- D. Piping that is to be purged after installation shall be tested and all repairs made prior to purging.

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- E. The Buyer's Representative shall be given two working days prior notification of the time and date of any testing to be performed.
- F. The Seller shall prepare and submit a hydrostatic and pneumatic test procedure, including test diagrams, and test report format.

3.3.2 Pressure Testing of Piping

- A. All pressure testing shall be per ASME B31.3.
- B. All piping systems shall be hydrostatically tested (carrier piping).
- C. The annular space of double contained pipe shall be pneumatically tested with air at 10 psig, meeting the requirements of paragraph 2.1.2.B of this specification.
- D. Carrier piping on Intra-Area Transfer lines shall receive a sensitive leak test per ASME B31.3, paragraph 345.8 in addition to the pressure test.

3.3.3 Pressure Test Preparation

- A. All joints, including welds, are to be left uninsulated and exposed for examination during the test. Joints may be insulated or coated once they have been previously tested in accordance with this specification.
- B. Pressure test gauges shall be calibrated per PFI ES-32. The calibration shall be made using a dead weight tester with calibration records traceable to the National Institute of Standards and Technology. Gauge shall be tagged with the dates of the last and next calibrations. The date of the gauge calibration shall be recorded by the Seller.
- C. The Seller shall furnish the pumps, gauges, measuring devices, temporary plug valves, and other miscellaneous equipment necessary for testing.
- D. The test fluid pressure, minimum duration, and acceptance criteria shall be in accordance ASME B31.3. The following additional requirements shall be included:
 - 1) The test pressure shall be applied and maintained for at least five minutes prior to start of minimum test duration to assure that the pressure has equalized.

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- 2) The test pressure shall be maintained for a time sufficient to examine all joints and connections for leakage, but in any case not less than ten minutes. The acceptance criteria is zero leakage. Leakage from temporary gaskets and seals, installed for the purpose of conducting the test and which will be replaced later may be permitted unless the leakage exceeds the capacity of the pressure source or maintain the required pressure for the duration of the test.
- 3) If leaks are found, then
 - their locations shall be marked;
 - the test pressure shall be gradually released;
 - the piping shall be drained;
 - appropriate repairs or replacement shall be made;
 - and the pressure testing shall be repeated until acceptable results have been achieved.

3.3.4 Test Records

- A. The Seller shall prepare and submit to the Buyer test reports for all piping systems requiring tests. The test reports shall contain, as a minimum, the following data:
 - 1) Job title and Contract Number
 - 2) Date of test
 - 3) Contract drawing and line numbers identification of piping systems
 - 4) Type of test, i.e., Hydrostatic, Pneumatic,
 - 5) Pressure applied and length of time at Test pressure
 - 6) Test results
 - 7) Test by
 - 8) Signature of Seller Test Supervisor
 - 9) Comments, if any
 - 10) Gauge identification and dates of last and next calibration

11) Signature or stamp of the Buyer's Representative

3.4 ADJUSTMENT

(Not Used)

3.5 CLEANING

3.5.1 Cleaning After Hydrotesting

A. After hydrotesting, the following procedure shall be followed:

- 1) Water used in cleaning Hastelloy C-22 and other alloy piping shall conform to Specification Section 13252.
- 2) Flushing velocity shall not exceed 10 feet per second but shall be a minimum of 4 feet per second.
- 3) Piping systems shall be flushed for a minimum of 10 minutes (continuous).
- 4) Visual examination of cleanliness shall be by visual examination of a clean white cloth used to filter the system discharge. Additional 10 minute flushes shall be performed until the visual examination reveals no visible debris collection on the cloth.
- 5) To ensure the absence of moisture after cleaning, lines shall be drained and blown dry. The drying procedure shall be per Specification 13252.
- 6) Immediately after cleaning, drying, and inspection, all non-flanged openings shall be tightly sealed with polyethylene caps to protect the bevel and pipe ends and to prevent the entry of moisture and foreign matter.

3.5.2 Cleaning After Pneumatic Testing

After pneumatic testing, piping shall be purged at a minimum velocity of ten feet per second until no foreign matter is seen exiting the pipe. Air quality shall be that specified per paragraph 2.1.2.B of this specification.

3.5.3 Cleaning Reports

All visual examinations, flushes, and purges shall be documented in a test report to be submitted to the Buyer.

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- 3.6 **PROTECTION**
 (Not Used)
- 3.7 **DEMONSTRATION**
 (Not Used)
- 3.8 **SCHEDULE**
 (Not Used)

END OF SECTION

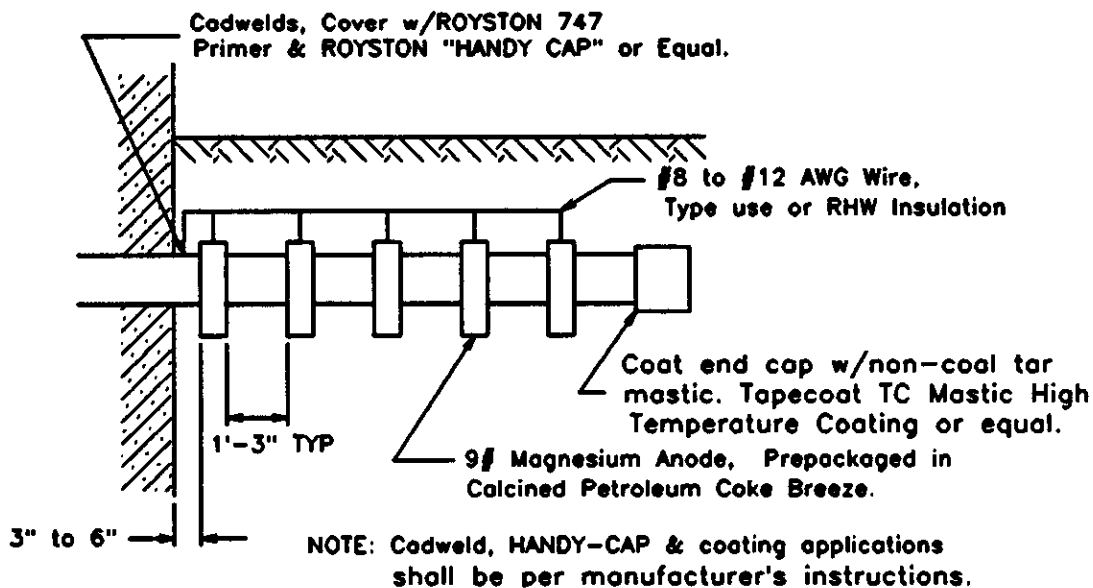
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ATTACHMENT A CATHODIC PROTECTION OF UNDERGROUND PIPING

Temporary Cathodic Protection Detail



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SECTION 15060
PIPING MATERIAL, FABRICATION, ERECTION
& PRESSURE TESTING (ALLOY PIPING)
B-595-C-B210A-15060

APPROVED FOR CONSTRUCTION

REVISION
ISSUE DATE 7/14/93

WAPA YES NO X
QUALITY LEVEL I II X
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

CHECKER:

Rod Wright 7/12/93
Rod Wright, Piping Engineer Date

Cliff Johnson 7/12/93
Cliff Johnson, Piping Engineer Date

APPROVED BY:

George Barauskas for George Barauskas
George Barauskas Lead Discipline Engineer

7-12-93
Date

JUL 15 1993

SECTION 15060
 PIPING MATERIAL, FABRICATION, ERECTION
 & PRESSURE TESTING (ALLOY PIPING)
 B-595-C-B210A-15060

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	CATHODIC PROTECTION OF UNDERGROUND LINES
B	DELETED
B	PIPING ABBREVIATION LIST

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SECTION 15060 PIPING MATERIAL, FABRICATION, ERECTION & PRESSURE TESTING (ALLOY PIPING)

PART 1 GENERAL

1.1 SUMMARY

This specification defines the requirements for the purchasing, fabrication, installation, erection, testing and cleaning of alloy steel piping materials.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI B16.5	1988 Pipe Flanges and Flanged Fittings
ASME/ANSI B16.9	1986 Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.1	1989 Power Piping, Including Addenda a
ASME B31.3	1990 Chemical Plant and Petroleum Refinery Piping, Including Addenda a & b

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 182/A 182M	1990 Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High- Temperature Service
ASTM A 193/A 193M	1990 Standard Specification for Alloy Steel and Stainless Steel Bolting Material for High-Temperature Service
ASTM A 194/A 194M	1990 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High- Pressure and High-Temperature Service
ASTM A 240	1991 Standard Specification for Heat- Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

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ASTM A 262	1986 Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM A 269	1990 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 312/A 312M	1991 Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A 351/A 351M	1989 Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
ASTM A 403/A 403M	1991 Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM B 366	1989 Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Welding Fittings
ASTM B 619	1991 Standard Specification for Welded Nickel and Nickel-Cobalt Alloy Pipe
ASTM B 622	1991 Standard Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
ASTM G 28	1985 Detecting Susceptibility to Intergranular Attack in Wrought, Nickel-Rich Chromium-Bearing Alloys, Test Methods of

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-4.1	1985 Cleaning Equipment for Oxygen Service
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C209	1990 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C214	1989 Tape Coating System for the Exterior of Steel Water Pipelines

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PIPE FABRICATION INSTITUTE (PFI)

PFI ES-3	1990 Fabrication Tolerances
PFI ES-24	1990 Pipe Bending Methods, Tolerance, Process and Material Requirements
PFI ES-32	1985 Tool Calibration

1.3 RELATED REQUIREMENTS

Specification Section 05062	Welding Piping
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 DEFINITIONS

The term "erection," where used in this specification, shall be defined as follows: Shop or field fabricated erection - the placing of any pipe or component of a piping or instrument system in its final position specified in the drawings and/or specifications.

1.5 SYSTEM DESCRIPTION

All components, fabrication, erection, and testing, except as otherwise qualified herein, shall be in accordance with the requirements of ASME B31.1 for steam and condensate systems, and ASME B31.3 for all other systems.

1.6 SUBMITTALS

Submit the following in accordance with Part III, Section I, Exhibit 5 of the Request for Proposal (RFP), Vendor Drawing and Data Requirements (VDDR).

1.6.1 Shop Drawings

Submit shop drawings of non-standard components per Paragraph 2.1.3A.

1.6.2 Quality Control Submittals

A. Factory Acceptance Tests (FATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

Submit corrosion test reports for each heat per Note 2 of Piping Material Class A3, Note 3 of Class C, and Note 4 of Class K.

B. Construction Acceptance Tests (CATS)

The following test reports shall include itemized test activities, inspection requirements and functional performance requirements, together with the corresponding acceptance criteria for the tests.

- 1) Submit Pressure Test Reports per Paragraph 3.3.4.
- 2) Submit cleaning reports per Paragraph 3.5.3.
- 3) Submit cleaning report for oxygen line per Paragraph 3.5.4.

1.6.3 Certificates

Submit Certified Material Test Reports (CMTRs) for all pressure containing and/or wetted parts.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

2.1.1 Piping Material Classes

- A. Piping Material Classes are listed herein conform to designations as shown on the Drawings.
- B. Unless otherwise specified, all pressures and temperatures listed are design conditions.
- C. Piping Material Classes/Services Index

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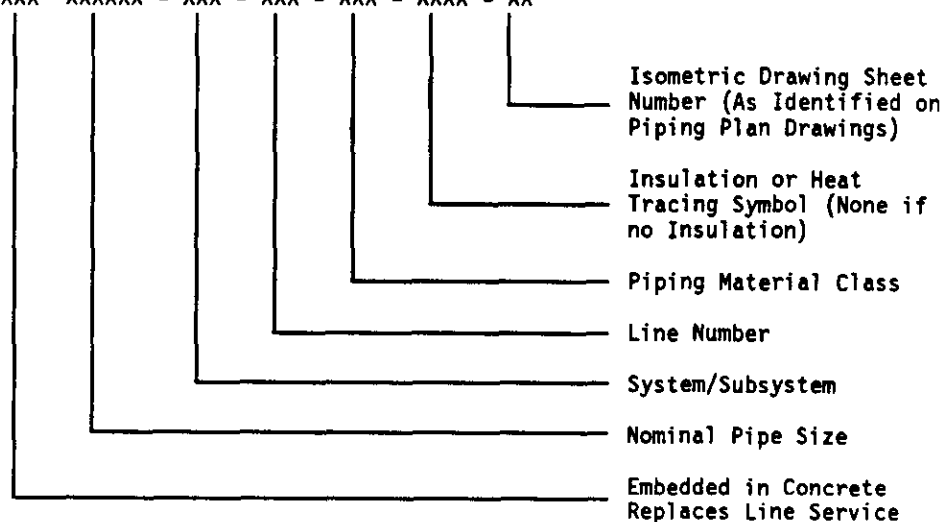
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CLASS	MATERIAL	RATING CLASS	SERVICES	
A	304L Stainless Steel	150 Butt Weld	Acetylene Argon Breathing Air Demineralized Water Electrical Conduit Firewater Helium Hot Tempered Water Hydraulic Oil Instrumentation Instrument Air Nitrogen	Oxygen Process Plant Air (Critical) Plant Air Process Cooling Water Return Process Cooling Water Supply Sample Regulated Drain Solenoid Valve Vent Vacuum Leak Detection
A3	304L Stainless Steel	300 Butt Weld	Decontamination Caustic Solution Medium Pressure Steam Nitric Acid Decontamination Solution Oxalic Acid Decontamination Solution Process Process Condensate Process Steam	
C	316L Stainless Steel	150 Butt Weld	Melter Off-Gas Process Vessel Vent	
C3	316L Stainless Steel	150 Butt Weld	Decontamination Mixture Solution	
K	Hastelloy C-22	150 Butt Weld	Sample Lines	

D. Identification of Piping

Example:

PE- 1" 420 086 A3 IH 01
XXX XXXXX - XXX - XXX - XXX - XXXX - XX



E. Piping Material Classes

Piping Material Class A (See Note 3)

General Material: 304L Stainless Steel
 Rating: Class 150
 Temperature Limit: -20°F through 450°F
 Maximum Pressure: Per ASME/ANSI B16.5
 Corrosion Allowance: .065"
 Construction: All Sizes Buttweld (except flanges at floor drain cleanouts)

ITEM

DESCRIPTION

Pipe

1/2" - 12" Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.

Fittings (ells, tees, caps, and reducers)

1/2" - 12" Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, Schedule 40S (See Note 1).

1/2" - 2" Class 3000 screwed by socketweld coupling, ASTM A 182/A 182M, Grade F304L, and threaded hex head plug, ASTM A 182/A 182M, Grade F304. (See Note 4).

Flanges (See Note 2)

1/2" - 12" Class 150 flat face slip-on type plate flange, 1/4" thick, ASME/ANSI B16.5 class 150 drilling, stainless steel ASTM A 240, Type 304L.

1/2" - 12" Class 150 flat face blind flange, ASME/ANSI B16.5 class 150 drilling and thickness, stainless steel ASTM A 240, Type 304L.

Gaskets (See Note 2)

1/2" - 12" Class 150, red rubber full face gasket, 1/8" thick, Sepco or equal.

Bolting

Stainless steel stud bolt, ASTM A 193/A 193M, Grade B8, class 2 with two stainless steel heavy hex nuts, ASTM A 194/A 194M, Grade 8S (Nitronic 60).

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Piping Material Class A (continued)

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Swages

1/2" - 2" Concentric swage, stainless steel ASTM A 403/A403M, Grade WP304L-S, schedule 40S, beveled both ends.

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Use for floor drain cleanouts only.
3. As an exception to the radiography (per Specification Section 05062) and pressure testing requirements for Piping Material Class "A", radiography and pressure testing will not be required for electrical penetrations. Electrical penetrations are identified as follows on the drawings:

System Number for the line will be 110, 120, 130, 14A, 14B, 15A, 15B, 15E, 15G, 16A, 16B, 170, 20A, 20B, 20C, 20D, 210, 220 or 230.

AND

Line Number will have a value between 900 and 999, inclusive.

EXAMPLE:

PE-2"-170-907-A

SYSTEM NUMBER

LINE NUMBER

4. Use only on electrical penetrations as depicted on drawings.

Piping Material Class A3

General Material: 304L Stainless Steel
Rating: Class 300
Temperature Limit: -20°F through 450°F
Maximum Pressure: 260 PSIG
Corrosion Allowance: .065" (See Note 3)
Construction: All Sizes Buttweld

ITEM	DESCRIPTION
------	-------------

Pipe

1/2" - 4"	Seamless stainless steel, schedule 40S, ASTM A 312/A 312M, Grade TP304L, beveled ends.
-----------	----------------------------------------------------------------------------------------

Fittings (ells, tees, caps, and reducers)

1/2" - 4"	Stainless steel, ASTM A 403/A 403M, Grade WP304L-S, buttweld type, schedule 40S. (See Note 1)
-----------	-----------------------------------------------------------------------------------------------

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Swages

1/2" - 2"	Concentric swage, stainless steel ASTM A 403/A 403M, Grade WP304L-S, schedule 40S, beveled both ends.
-----------	-------------------------------------------------------------------------------------------------------

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for all line sizes for jumpers; and for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Deleted.
3. All embedded lines have been checked to ensure an available corrosion allowance of 0.08 inch minimum. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of 0.08 inch.

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Piping Material Class C

General Material: 316L Stainless Steel
Rating: Class 150
Temperature Limit: -20°F through 400°F
Maximum Pressure: Per ANSI B16.5
Corrosion Allowance: .03"
Construction: All Sizes Buttweld

ITEM DESCRIPTION

Pipe

1/2" - 12" Seamless stainless steel, schedule 40S, ASTM A 312, Grade TP316L, beveled ends. (See Note 3)

Fittings (ells, tees, caps, and reducers)

1/2" - 12" Stainless steel, ASTM A 403, Grade WP316L-S, buttweld type, schedule 40S. (See Notes 1 and 3)

Flanges (See Note 2)

1/2" - 12" Class 150 flat face slip-on type plate flange, 1/4" thick, ASME/ANSI B16.5 class 150 drilling, stainless steel ASTM A 240, Type 316L.

1/2" - 12" Class 150 flat face blind flange, ASME/ANSI B16.5 class 150 drilling and thickness, stainless steel ASTM A 240, Type 316L.

Gaskets (See Note 2)

1/2" - 12" Class 150, red rubber full face gasket, 1/8" thick, Sepco or equal.

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Swages

1/2" - 2" Concentric swage, stainless steel ASTM A 403, Grade WP316L-S, schedule 40S, beveled both ends.

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Piping Material Class C (Continued)

ITEM	DESCRIPTION
------	-------------

Bolting

Stainless steel stud bolt, ASTM A 193, Grade B8, class 2 with two stainless steel heavy hex nuts, ASTM A 194, Grade 8S (Nitronic 60).

Thread Compounds

For flange bolts - "Pure Nickel Special" nuclear grade Never-Seez or equal.

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Use for floor drain cleanouts only.
3. Deleted.

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Piping Material Class C3

General Material: 316L Stainless Steel
Rating: Class 300
Temperature Limit: -20°F through 400°F
Maximum Pressure: Per ANSI B16.5
Corrosion Allowance: .03"
Construction: All Sizes Buttweld

ITEM DESCRIPTION

Pipe

1/2" - 2" Seamless stainless steel, schedule 40S, ASTM A 312, Grade TP316L, beveled ends.

Fittings (ells, tees, caps, and reducers)

1/2" - 2" Stainless steel, ASTM A 403, Grade WP316L-S, buttweld type, schedule 40S. (See Notes 1, and 2)

Swages

1/2" - 2" Concentric swage, stainless steel ASTM A 403, Grade WP316L-S, schedule 40S, beveled both ends.

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for all line sizes for jumpers; and for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. All embedded lines have been checked to ensure an available corrosion allowance of 0.08 inch minimum. New "field addition" embedded lines shall be checked to ensure that available corrosion allowance is a minimum of 0.08 inch.
3. Deleted.

Piping Material Class K (See Note 4)

General Material: Hastelloy C-22 or equal
Rating: Class 150
Temperature Limit: -20°F through 400°F
Maximum Pressure: per ASME/ANSI B16.5
Corrosion Allowance: .065"
Construction: All Sizes Buttweld/Flanged

ITEM

DESCRIPTION

Pipe

1/2" - 10" Seamless Hastelloy C-22 or equal, schedule 40S, ASTM B 622, Alloy N06022, beveled ends (See Note 2).

Fittings (ells, tees, caps, and reducers)

1/2" - 10" Hastelloy C-22 or equal, buttweld type, schedule 40S, beveled ends, seamless to ASTM B 366, Grade WPHC22-S (See Notes 1 and 3).

Branch Construction

Use reducing tees within the size range of tees per ASME/ANSI B16.9. Use reducing tees and reducers where not within the size range of ASME/ANSI B16.9.

Swages

1/2" - 10" Concentric swage, Hastelloy C-22 or equal, schedule 40S, beveled both ends, seamless to ASTM B 366, Grade WPHC22-S (See Note 3).

Notes:

1. Use pipe bends with a radius of 5 nominal pipe diameters in place of elbows for all line sizes for jumpers; and for 1/2" through 2" line sizes for embedded piping, where shown on the drawings.
2. Pipe with a longitudinal weld seam in accordance with ASTM B 619, Alloy N06022 is an acceptable substitute provided the weld seam is radio-graphically examined in accordance with Paragraph 4.2.5 of ASTM B 366.
3. Fittings/swages with weld seams to ASTM B366, Grade WPHC22-WX are acceptable substitutions.

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Piping Material Class K (Continued) (See Notes 4, 5, and 6)

4. Certified Material Test Reports (CMTRs) for Hastelloy C-22 or equal Material shall include certification that each heat has been tested per ASTM G 28, Practice B in accordance with Paragraph 2.1.4D.
5. Melting Practice for Hastelloy or equal alloys shall consist of:
 - a. Electric Arc primary melting.
 - b. Argon/Oxygen Decarburization treatment.
 - c. Electroslag remelting into final ingot.
6. Alloy composition for Hastelloy C-22 or equal material shall be within the following limits:

ELEMENT	MINIMUM %	MAXIMUM %
Nickel	Balance	Balance
Chromium	21.00	22.40
Molybdenum	12.90	13.90
Iron	3.10	4.80
Tungsten	2.60	3.40
Carbon		0.010
Phosphorus		0.02
Sulfur		0.010
Silicon		0.08
Cobalt		2.5
Manganese		0.5
Vanadium		0.35

These limits are more stringent than those imposed by the ASTM Specifications.

2.1.2 Pressure Testing Materials

A. Test Water Requirements

Water used for cleaning and/or hydrotest shall conform to Specification Section 13252.

B. Pneumatic Air Requirements

The air for pneumatic testing shall have a dew point of -20°F or less at atmospheric pressure and shall contain less than 10 parts per million oil.

C. Leak Detector Solution

Leak detector solution for pneumatic testing shall be Nupro "Snoop" or equal.

D. Pressure Test Plugs

Open ends of piping systems (i.e., plain end or beveled end) that cannot otherwise be blanked off for pressure testing shall be closed off with commercial pressure test plugs suitable for the pipe size and test pressure.

2.1.3 Components

General

The requirements contained in this Section shall apply to all Material Classes included in this specification.

A. Pipe, fittings, flanges, and all other piping components (i.e., valves, strainers, gaskets, bolting, etc.) shall be standard components conforming to the standards listed in ASME B31.1, Appendix F for steam and condensate systems; and ASME B31.3, Appendix E, for all other systems within the size ranges of those codes. Where such conformance is not possible (i.e., fittings smaller than 1/2" nominal pipe size, manufacturer's proprietary design, etc.), the Seller shall submit a dimensional drawing of the component, and the component shall be certified by the manufacturer as being suitable for the design conditions of the applicable material class. The Seller shall adjust field dimensions if the materials procured do not correspond to the dimensions depicted on the drawings.

B. Fittings shall conform to ASME/ANSI B16.9 (for butt weld fittings).

2.1.4 Corrosion Evaluated Material (CEM) Requirements

- A. Piping lines requiring CEM material are indicated by notes on the piping Contract Drawings and on the line list.
- B. Type 304L SS material shall be corrosion tested per ASTM A262, Practice C when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.002 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- C. Type 316L SS material shall be corrosion tested per ASTM A262, Practice B when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.004 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- D. Hastelloy C-22 material shall be corrosion tested per ASTM G28, Practice B when indicated on the Contract Drawing. One test shall be conducted per heat of material. The acceptance criteria shall be measured corrosion rate of less than 0.0008 inches/month. A Certified Material Test Report (CMTR) with the above corrosion testing requirement for the actual heat of material used is acceptable. Typical CMTRs are not acceptable.
- E. Piping that is fabricated with CEM And is hot-formed or heat-treated may require addition corrosion testing after fabrication depending upon the type of hot-forming or heat-treatment. This may be accomplished by corrosion testing a CEM coupon of the same heat as the piping being fabricated, provided said coupon has been subjected to the same hot-forming or heat-treatment cycle as the finished product. If the coupon does not pass the corrosion test, results will be submitted to the Buyer for evaluation. The entire part may need a solution anneal heat-treatment if the Buyer's evaluation determines that this is required.
- F. Double contained piping only requires CEM for the carrier piping material.
- G. Weld filler metal does not require CEM testing.

2.1.5 Buried Warning and Identification Tape

Tape shall be an alkali-resistant polyethylene plastic tape manufactured specifically for warning and identification of buried utility lines, and shall be provided in rolls, 6 inches wide with minimum thickness of 0.004 inch and shall have a minimum strength of 1750 pounds per square inch lengthwise and 150 pounds per square inch crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. The tape shall be as specified in Table 1 and shall be imprinted in bold black letters continuously and repeatedly over entire tape length.

TABLE 1

Red: Gas, Oil, Dangerous Materials

Blue: Water or Air Systems

Warning and identification shall be "CAUTION BURIED (Intended Service) LINE BELOW" or similar wording. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in the trench backfill.

2.1.6 Deleted.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Shop Assembly

A. Welding

Welding and weld examination shall be in accordance with Specification Section 05062. All slip-on type flanges shall be double welded (Reference - ASME B31.3, Figure 328.5.2B).

B. Internal Misalignment

Where the ends of piping components are to be joined by welding and the internal surface misalignment exceeds the dimensional limits of the qualified welding procedure, one of the following procedures shall be used to correct this condition.

- 1) Taper bore or grind the wall of the component extending internally using a 4 to 1 maximum taper. Such tapering shall not result in a finished wall thickness, before welding, that is less than the nominal pipe wall thickness minus the manufacturer's mill tolerance. Further reduction of the wall thickness requires Buyer's authorization.

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- 2) Use spreaders or internal and/or external lineup clamps to correct moderate out-of-round condition.

C. Cleanliness

Cleanliness requirements for fabrication, handling and storage of 300 series stainless steel piping shall be per Specification Section 13252.

- D. Any deviations in dimensions from the drawings shall be submitted to the Buyer in writing, for approval, prior to fabrication of the affected piping.
- E. Dimensions on the Piping Plan drawings are in inches when dimensions are less than 1'-0". Feet and inches are shown when dimensions are 1'-0" and more. Dimensions on the Piping Isometric drawings are in inches when less than 2 feet. Feet and inches are shown when dimensions are 2 feet or greater.
- F. Dimensions are to the centerline of pipe.
- G. Where cold spring (CS) or prespring (PS) is required, the Piping drawings have been adjusted to accommodate this. The piping shall be fabricated to the dimensions shown.
- H. Reducers are concentric (except for slurry services) unless otherwise noted on the drawings.

2.2.2 Fabrication - Dimensional Tolerances

Pipe fabrication tolerances shall be in accordance with Pipe Fabrication Institute PFI ES-3.

2.2.3 Fabrication - Pipe Bending

- A. Fabrication involving the bending of pipe shall be done in accordance with Pipe Fabrication Institute PFI ES-24.
- B. When five diameter bends "5D" are referenced, they are to be fabricated in accordance with the 5D requirements. (The requirements for 5Dn are not to be applied under any circumstance.)
- C. The wall thickness after bending shall be not less than 87.5 percent of the initial wall thickness.

2.2.4 Packaging and Shipping

- A. Preparation for shipment shall conform to the manufacturer's standard, and as a minimum shall provide protection against corrosion and damage from normal handling and storage.

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- B. All pipe ends shall be protected by means of a plastic (non-PVC) or 300 series stainless steel plug or cap.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION APPLICATION AND ERECTION

3.2.1 Field Fabrication and Erection

- A. All field fabrication shall conform to Paragraph 2.2 titled "Fabrication," except that field installation tolerances shall be plus or minus 1/2".
- B. All piping and tubing shall be fabricated and installed in accordance with the Piping drawings.
- C. Coordinates and elevations are used extensively on the Piping drawings. The Seller shall establish the required fabrication dimensions.
- D. Elevations are designated as follows:
- | | |
|-------------------|------------------------------------------------------|
| Nonsloped lines - | "Bottom of Pipe" (BOP EL _____) |
| | "Centerline Elevation" (CL EL _____) |
| | "Beveled End Elevation" (BE EL _____) |
| | "Plain End Elevation" (PE EL _____) |
| Sloped lines - | "Centerline Work Point Elevation" (CL W.P. EL _____) |
- E. Piping shall be examined before and after erection to ensure that all foreign matter has been removed from the exterior and interior surfaces.
- F. The Seller shall be responsible for the proper horizontal and vertical alignment of the piping as shown on the drawings.
- G. The Seller shall place buried warning and identification tape conforming to paragraph 2.1.4 to identify the presence of underground piping at a depth of 12 inches below finished grade or as shown on the Contract Drawings.
- H. Fitting make-up is not dimensioned on the drawings.

- I. Installation of temporary cathodic protection for metallic underground lines shall be in accordance with Attachment A, for underground lines which are to be buried by the Seller.

3.2.2 Coatings for Underground Piping

All single contained stainless steel piping in underground service shall be protected from exterior corrosion by use of a cold applied tape wrap. Materials, surface preparation, application and inspection requirements shall be in accordance with AWWA C209 and C214.

3.3 FIELD QUALITY CONTROL

3.3.1 Pressure Tests

- A. The minimum test pressure is the lowest allowable test pressure gauge reading (the calculated test pressure plus the additional pressure resulting from the static head of the test fluid above the test gauge).
- B. The maximum test pressure shall be the greater of:
 - 1) 1.1 times (1.1x) the minimum test pressure based on the applicable piping code.
 - 2) 60 psi greater than the minimum test pressure based on the applicable piping code.
- C. Prior to initial operation, all installed piping shall be tested except where otherwise qualified by this specification.
- D. Piping that is to be purged after installation shall be tested and all repairs made prior to purging.
- E. The Buyer's Representative shall be given two working days prior notification of the time and date of any testing to be performed.
- F. The Seller shall prepare and submit a hydrostatic and pneumatic test procedure, including test diagrams, and test report format.

3.3.2 Pressure Testing of Piping

- A. All pressure testing shall be per ASME B31.1 for steam and condensate systems; and ASME B31.3 for all other systems.

The alternate initial service tests as allowed in ASME B31.1 shall not be utilized.
- B. All piping systems shall be hydrostatically tested with the exception of the following systems (service to be identified on the pipe line list) which shall be pneumatic tested.

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Service

Instrument Air (Cat I) Instrument Air

- C. As an exception to the paragraphs above, leak detection probe piping connected to the annular space of double wall sumps shall be tested with a pneumatic test of 0.5 to 1.0 pounds per square inch-gage. The maximum pressure test shall not be exceeded.

3.3.3 Pressure Test Preparation

- A. All joints, including welds, are to be left uninsulated and exposed for examination during the test. Joints may be insulated or coated once they have been previously tested in accordance with this specification.
- B. Pressure test gauges shall be calibrated per PFI ES-32. The calibration shall be made using a dead weight tester with calibration records traceable to the National Institute of Standards and Technology. Gauge shall be tagged with the dates of the last and next calibrations. The date of the gauge calibration shall be recorded by the seller.
- C. The Seller shall furnish the pumps, gauges, measuring devices, temporary plug valves, and other miscellaneous equipment necessary for testing.
- D. The test pressure, minimum duration, and acceptance criteria shall be in accordance with the applicable code or standard referenced in Paragraph 3.3.2A. The following additional requirements shall be included:
- 1) The test pressure shall be applied and maintained for at least five minutes prior to start of minimum test duration to assure that the pressure has equalized.
 - 2) The test pressure shall be maintained for a time sufficient to examine all joints and connections for leakage, but in any case not less than ten minutes. The acceptance criteria is zero leakage.
 - 3) If leaks are found, then
 - their locations shall be marked;
 - the test pressure shall be gradually released;
 - the piping shall be drained;

appropriate repairs or replacement shall be made; and the pressure testing shall be repeated until acceptable results have been achieved.

3.3.4 Test Records

The Seller shall prepare and submit to the Buyer test reports for all piping systems requiring tests. The test reports shall contain, as a minimum, the following data:

- A. Job title and contract number
- B. Date of test
- C. Contract drawing and line numbers identification of piping systems
- D. Type of test, i.e., hydrostatic, pneumatic
- E. Pressure applied and length of time at test pressure
- F. Test results
- G. Test by
- H. Signature of Seller Test Supervisor
- I. Comments, if any
- J. Gauge identification and dates of last and next calibration
- K. Signature or stamp of the Buyer's representative

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

3.5.1 Cleaning After Hydrotesting

- A. After hydrostatic test, the following procedure shall be followed:
 - 1) Water used in cleaning austenitic stainless steel and other alloy piping shall conform to Specification Section 13252.
 - 2) Flushing velocity shall not exceed 10 feet per second but shall be a minimum of 4 feet per second.

- 3) Piping systems shall be flushed for a minimum of 10 minutes (continuous).
- 4) Visual examination of cleanliness shall be by visual examination of a clean white cloth used to filter the system discharge. Additional 10 minute flushes shall be performed until the visual examination reveals no visible debris collection on the cloth.
- 5) To ensure the absence of moisture after cleaning, lines shall be drained and blown dry. Drying procedure shall be per Specification Section 13252.
- 6) Immediately after cleaning, drying, and inspection, all non-flanged openings shall be tightly sealed with plastic (not PVC) caps to protect the bevel and pipe ends and to prevent the entry of moisture and foreign matter.

3.5.2 Cleaning After Pneumatic Testing

After pneumatic testing, piping shall be purged at a minimum velocity of ten feet per second until no foreign matter is seen exiting the pipe. Air quality shall be that specified per paragraph 2.1.2.B of this specification.

3.5.3 Cleaning Reports

All visual examinations, flushes, and purges shall be documented in a test report to be submitted to the Buyer.

3.5.4 Cleaning of Oxygen Line

Oxygen line PE-1/2"-210-126-A shall be cleaned and protected for oxygen service in accordance with the recommendations of CGA G-4.1. An inspection report as required by CGA G-4.1 shall be submitted.

3.6 PROTECTION

All open ends of piping shall be protected with polyethylene or stainless steel caps or plugs.

3.7 DEMONSTRATION

(Not Used)

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3.8 SCHEDULES

 (Not Used)

END OF SECTION

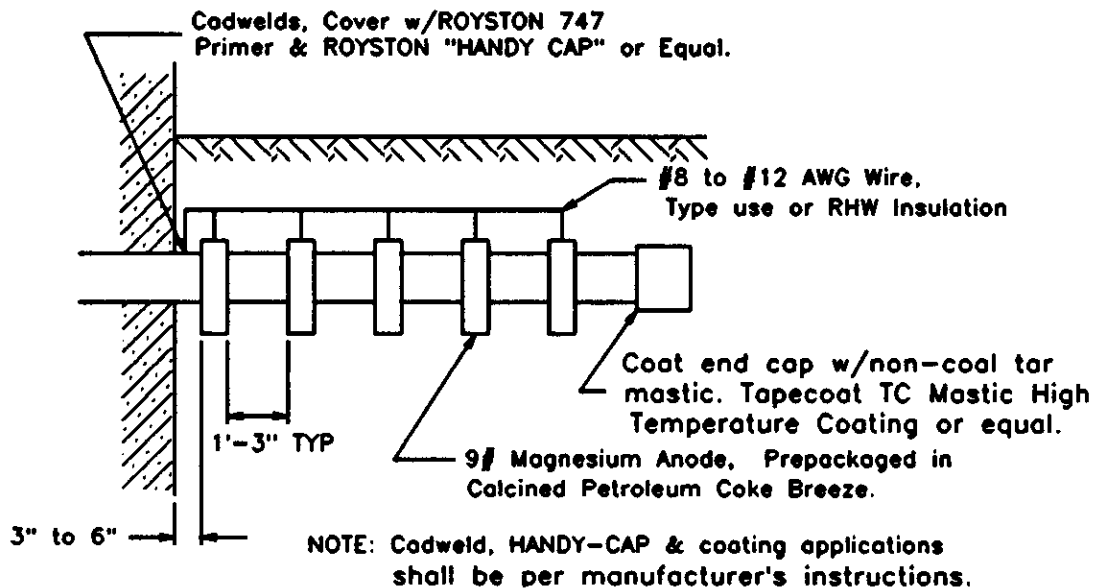
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ATTACHMENT A CATHODIC PROTECTION OF UNDERGROUND PIPING

Temporary Cathodic Protection Detail



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ATTACHMENT B
PIPING SPECIALTY ITEM LIST

(Deleted)

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ATTACHMENT B PIPING ABBREVIATION LIST

AFC	APPROVED FOR CONSTRUCTION	MATL	MATERIAL
APPV'D	APPROVED	MGR	MANAGER
ATM	ATMOSPHERIC	MIN	MINIMUM
BE	BEVEL END	MISC	MISCELLANEOUS
BLDG	BUILDING	N	NORTH
BW	BUTTWELD	NO.	NUMBER
CHK'D	CHECKED	NPS	NOMINAL PIPE SIZE
CL	CLASS	NS	NOMINAL SIZE
CO	CLEANOUT	N.S.	NOMINAL SIZE
CONC	CONCENTRIC	OD	OUTSIDE DIAMETER
CONFIG	CONFIGURATION	OPER	OPERATING
CONN.	CONNECTION	PE	PLAIN END
CONT.	CONTINUED	PDS	PLANT DESIGN SYSTEM
CR-MO	CHROME-MOLYBDENUM	PLCS	PLACES
CWBS	CONTRACT WORK BREAKDOWN STRUCTURE	PRESS	PRESSURE
CWP	COLD WORKING PRESSURE	PROJ	PROJECT
DBL	DOUBLE	PSIG	POUNDS PER SQUARE INCH-GAGE
DEG	DEGREE	PT	PART
DES	DESIGN	P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
DF	DRAIN FUNNEL	QA	QUALITY ASSURANCE
DIA	DIAMETER	QTY	QUANTITY
DIR	DIRECTOR	RAD	RADIUS
DWG	DRAWING	REF	REFERENCE
ECC	ECCENTRIC	REG	REGULATED
EL	ELEVATION (HEIGHT)	REQD	REQUIRED
EL+	(POSITIVE HEIGHT)	REV	REVISION
ENGR.	ENGINEER	REV.	REVISION
ELL	ELBOW	R&C	REVIEW & COMMENT
ETC	ETCETERA	SCH	SCHEDULE
EXCA	EXCAVATION	SFTY	SAFETY CLASS
FALL	SLOPE	SH	SHEET
FD	FLOOR DRAIN	SMLS	SEAMLESS
FLG	FLANGE	STL	STEEL
FLR	FLOOR	STRS	STRESS CHECK
FW	FIELD WELD	SVC	SERVICE
HP	HIGH POINT	SYS	SYSTEM
HPFS	HIGH POINT FINISHED SURFACE	SS	STAINLESS STEEL
HORIZ	HORIZONTAL	TEMP	TEMPERATURE
ID	INSIDE DIAMETER	TEMP.	TEMPERATURE
IE	FOR EXAMPLE	THK	THICKNESS
INS	INCHES	TYP	TYPICAL
INSUL	INSULATION	VERT	VERTICAL
ISO	ISOMETRIC	VIT	VITRIFICATION
LR	LONG RADIUS	VIT.	VITRIFICATION
MAT'L	MATERIAL	W	WEST

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WN	WELD NECK	°F	DEGREE(S) FAHRENHEIT
WP	WORK POINT	℄	CENTERLINE
W/	WITH	∅	DIAMETER
△	ANGLE DOWN	X°	DEGREE (ANGLE)
&	AND	X'	MINUTES OR FEET
@	AT	-	MINUS
		+	PLUS

9513336.1165

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT
B-595-C-B210A-15196

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	___
			3	<u>X</u>
			4	___

ORIGINATOR:

CHECKER:

<u>J. D. Lowerre, Jr.</u>	<u>8 Jul 93</u>	<u>D. A. Buzzelli</u>	<u>7-8-93</u>
J. D. Lowerre, Tech. Writer (Mech.)	Date	D. A. Buzzelli, Lead Disc Checker	Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT
B-595-B-B210A-15196

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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	LAYOUT EXHIBITS (TYPICAL)

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

Rev. 1

**SECTION 15196
IDENTIFICATION AND TAGGING METHODS
FOR MECHANICAL EQUIPMENT**

PART 1 GENERAL

1.1 SUMMARY

This specification section describes the technical requirements for the design, material and fabrication of permanent and temporary identification methods applicable to manufactured or procured parts, subassemblies and assemblies.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1 1981 (Rev. 85) Scheme for the
Identification of Piping Systems

MILITARY STANDARDS

MIL-STD-889B 1988 (Notice 2) Dissimilar Metals

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 29 CFR 1910.96 1990 Ionizing Radiation

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

(Not Used)

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

- 1.6.1 Seller shall submit material safety data sheets. These data sheets shall certify that all materials used for the application and removal of marking on corrosion-resistant, stainless steel and some nickel-based alloys shall be free of halides and low melting-point elements to the extent specified in Paragraph 2.1.1 B.
- 1.6.2 Seller shall submit certification of the processes used for permanent marking. Tools used to apply permanent marking and the resultant mark shall be in accordance with the applicable requirements in Paragraph 2.2. To preclude repeated examination of production marking, tools and sample markings made by said tools shall be examined to determine accordance with applicable requirements.
- 1.7 **CLASSIFICATION OF SYSTEMS AND COMPONENTS**
(Not Used)
- 1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**
(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Material Compatibility - Materials used for permanent or temporary marking or for the removal of markings shall be physically and chemically compatible with the material to which the markings will be applied or removed. The following shall be avoided:
 - A. The use of dissimilar metals in permanent contact as defined in MIL-STD-889B.
 - B. The use on corrosion-resistant, stainless steel and some nickel-base alloys of materials containing more than:
 - 1. one-half percent by weight of halides (chlorides and fluorides),
 - 2. one-half percent by weight of sulfur, and
 - 3. a sum total of one-half percent by weight of low melting-point elements such as cadmium, aluminum, lead, zinc and mercury.
 - C. Permanent marking of critical stainless steel components using labels, tape, paint or other marking materials that could cause crevice corrosion.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Requirements

2.2.1.1 Cleanliness - Surfaces to be marked shall be cleaned of oil, grease, dirt, corrosion or any other material that would adversely affect the application or adhesion of the marking.

2.2.1.2 Legibility - All markings shall be clearly legible. Color markings, including black and white, shall contrast with the color of the surface to which it is applied. Freehand lettering for the purpose of temporary marking shall be in the printed form and be uppercase (caps).

2.2.2 Permanent Identification Methods

- Type 1 Vibratory Marking
- Type 2 Die Stamping
- Type 3 Raised marking forged or cast into the surface
- Type 4 Recessed marking forged or cast into the surface
- Type 5 Electrochemical etch
- Type 6 Nameplate
- Type 7 Self-adhesive label
- Type 8 Painting
- Type 9 Packaging
- Type 10 Tagging

2.2.2.1 Type 1: Vibratory Marking - Vibrating tools shall be fitted with a carbide marking point or equivalent. Tools shall be adjusted to produce a shallow, rounded impression 0.003 to .101 inch in depth. The marking tool tip minimum radius shall be 0.005 inch. The size (height) of characters produced by vibratory marking shall be selected within the range of 1/16 to 1/2 inch.

2.2.2.2 Type 2: Die Stamping - Die stamps shall be low-stress type stamps. The minimum tip radius of the dies shall be in accordance with the following character sizes:

CHARACTER SIZE (INCH)	MINIMUM TIP RADIUS (INCH)
1/16	0.005
3/32	0.006
1/8	0.007
3/16	0.008
1/4	0.010
3/8	0.012
1/2	0.014

A. Impression depth shall not exceed 0.10 inch.

- B. Die stamp marking shall be applied to a flange, an integrally-cast or forged boss or pad, the base or support of the item or other visible low-stress location.
- C. The material thickness of an item to be marked shall not be reduced by die stamping to less than the minimum specified on the component drawing or specification (if available).

2.2.2.3 Types 3 and 4: Raised/Recessed Markings - Raised or recessed identification markings that are cast into the surface of the item are acceptable. Recessed markings shall not reduce the material thickness of an item to less than the minimum specified on the component drawing or specification. The size of forged or cast characters called out on the drawing or specification shall only be limited by the space available, but shall in no case be less than 0.09 inch in height.

2.2.2.4 Type 5: Electrochemical Etching - The electrolyte and neutralizer used for electrochemical etching shall be compatible with the material to be marked. The depth of etching shall be no greater than 0.5 percent of the material thickness or 0.003 inch, whichever is less. The size of characters produced by electrochemical etching shall be selected within the range of 1/16 to 1/2 inch. However, the recommended minimum size is 0.1 inch to accommodate typing applications.

2.2.2.5 Type 6: Nameplates

- A. The physical requirements (e.g., dimensions, character size and arrangement) for metal nameplates shall either be detailed on the applicable drawing or specification; or defined by reference to an applicable nameplate standard, specification or drawing. Metal nameplates shall be austenitic stainless steel. They shall contain not less than the following information:

Equipment description
Purchase order number
Equipment item number
Seller's name (if different from manufacturer)
Manufacturer's name
Manufacturer's model number
Manufacturer's serial number
Rated capacity
Size and type
Year built
Project identification
CVI number (to be marked by Buyer)

A typical metal nameplate layout is shown in Attachment A.

- B. The attachment method and location on the item of either nameplate type shall be established on the basis of stress imposed on the item. The method shall consider possible crevice corrosion between the nameplate and the item surface. When attached by welding, metal nameplates shall be welded in accordance with the welding requirements applicable to the item. If the welded nameplate is removed, the affected area shall be tested in accordance with the welding requirements applicable to the item.

2.2.2.6 Type 7: Self-Adhesive Labels - Self-adhesive labels may be used for identification provided they are in accordance with the requirements specified in Paragraph 2.1.1. When used to mark components in systems such as piping or electrical systems, or used as regulatory marking, self-adhesive labels shall be in accordance with applicable government, society or industry standards and codes. For example:

- A. When marking a piping system, a recognized standard such as ANSI A13.1 shall be specified on the applicable drawing/specification along with this specification section.
- B. If labels are used to identify system or component radiation hazards, a standard such as OSHA 29 CFR Section 1910.96 shall be specified on the applicable drawing/specification along with this specification section.

2.2.2.7 Type 8: Painting - Paints suitable for the purpose and/or as specified shall be used to apply stenciled markings to items (see Paragraphs 2.1.1 and 2.2.1.2). Stenciled markings may be applied using a template or silkscreen. The size of the stenciled characters specified on the drawing/specification shall be selected within the range of 1/3 to 3 inches. The color and type of paint to be used shall also be in accordance with the drawing/specification. Crafted (freehand sign painted) application of marking in lieu of stenciling is acceptable.

2.2.2.8 Type 9: Packaging - Identical items too small to be identified individually may be packaged in a box or bag marked with the item identification as shown in Paragraph 2.2.2.9 A.

2.2.2.9 Type 10: Tagging

- A. Tags shall be austenitic stainless steel. They shall be impression-stamped with not less than the following information:

Purchase order number
Purchase order item number
Equipment item number
CVI number (to be marked by Buyer)

A typical tag layout is shown in Attachment A.

- B. Tags shall be attached to the component they identify with stainless steel wire. Tagging is done in addition to the equipment nameplate. Equipment shipped in fully-enclosed containers shall have the information from A. clearly marked on the container exterior.
- C. Miscellaneous parts shall be tagged or marked with the equipment item number for which they are intended.
- D. Equipment which contains insulating oils, antifreeze solutions or other liquids shall be prominently tagged at every opening. Tags shall indicate the nature of the contents and precautions for shipping and storage.

2.2.3 Temporary Identification Methods

- Type A Rubber stamp and ink
- Type B Rubber roller or wheel and ink
- Type C Felt-tip marking pen
- Type D Removable self-adhesive label or tape
- Type E Label attached with removable tape
- Type F Removable tag
- Type G Packaging
- Type H Scribing tool
- Type J Paint stick
- Type K Metal tag

- 2.2.3.1 Inks - Inks used for all type of temporary markings including felt-tipped pens, rubber stamps, rubber roller and rubber wheel shall be in accordance with the requirements of Paragraph 2.1.1 B.
- 2.2.3.2 Self-Adhesive Labels and Tape - The adhesives of self-adhesive labels and tape used for temporary marking shall be in accordance with the requirements of Paragraph 2.1.1.
- 2.2.3.3 Tagging - Items not suited for other methods of identification may be tagged. Tags and attaching materials shall be compatible with the item material in accordance with Paragraphs 2.1.1 A and 2.1.1 B. Materials used for temporary identification tagging shall be selected on the same basis as for permanent identification tagging (see Paragraph 2.2.2.9).
- 2.2.3.4 Packaging - Packaging requirements for temporary identification shall be the same as for permanent identification (see Paragraph 2.2.2.8).

- 2.2.3.5 Scribing Tool - Scribing tools may be used for temporary identification during fabrication or construction provided such marking is not applied to critical surfaces such as finished, machined or sealing surfaces.
- 2.2.3.6 Removal of Temporary Marking - All temporary marking shall be removed from stainless steel and corrosion-resistant material surfaces after fabrication. All visible traces shall be removed. Solvent used for marking removal shall be in accordance with Paragraph 2.1.1 B.
- 2.2.4 Testing
- 2.2.4.1 Visual Inspection - Item surfaces and marking shall be visually inspected to determine conformance to the applicable requirements specified in Paragraphs 2.2.1.1 and 2.2.1.2.

PART 3 EXECUTION

(Not Used)

END OF SECTION

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

Rev. 1

ATTACHMENT A
LAYOUT EXHIBITS (TYPICAL)

EXHIBIT 1. NAMEPLATE LAYOUT (TYPICAL)

P.O. NUMBER	ITEM NUMBER
SERIAL NUMBER	MODEL NUMBER
EQUIPMENT DESCRIPTION	
MANUFACTURED BY	
SIZE	TYPE
RATED CAPACITY	YEAR BUILT
P.O. ITEM NUMBER	CVI NUMBER
PROJECT	

EXHIBIT 2. TAG LAYOUT (TYPICAL)

P.O. NUMBER
P.O. ITEM NUMBER
EQUIPMENT ITEM NUMBER
CVI NUMBER

9513336.1175

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION B210A
RELATED DOCUMENT NO. 1
PIPING ISOMETRICS
B-595-C-B210A-RD-1

APPROVED FOR CONSTRUCTION

REVISION 2
ISSUE DATE 7-15-93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>*</u>	II	<u>*</u>
SAFETY CLASS	1*	<u>2*</u>	3*	<u>4*</u>

*See Individual Isometrics

ORIGINATOR:

CHECKER:

F. E. Griffin 7-14-93
F. E. Griffin, Piping Date

G. F. Van Leyden 7-14-93
G. F. Van Leyden, Piping Supervisor Date

APPROVED BY:

J. C. Duss for George Barauskas
G. Barauskas Lead Discipline Engineer

7-14-93
Date

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126175	3	0	02/12/93	PE-3"-520-045-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	4	0	02/12/93	PE-3"-520-066-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	5	0	02/12/93	PE-3"-520-069-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	8	0	02/16/93	PE-3"-110-017-DD-1h SHEET 01 PIPING ISOMETRIC	HOLD NO. HWVP-FD-240 & 241	1
H-2-126175	9	0	02/12/93	PE-3"-520-234-DD-NONE SHEET 07 PIPING ISOMETRIC		
H-2-126175	10	0	02/12/93	PE-3"-520-234-DD-NONE SHEET 08 PIPING ISOMETRIC		
H-2-126175	11	0	01/04/93	PE-3"-520-234-DD-NONE SHEET 09 PIPING ISOMETRIC		
H-2-126175	13	0	02/12/93	PE-1/2"-15A-105-K-1h SHEET 01 PIPING ISOMETRIC		
H-2-126175	14	0	02/12/93	PE-1"-20C-172-A-1h SHEET 01 PIPING ISOMETRIC		
H-2-126175	15	0	02/12/93	PE-1"-20C-172-A-1h SHEET 02 PIPING ISOMETRIC		
H-2-126175	16	0	02/10/93	PE-2"-20C-203-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	17	0	02/12/93	PE-1"-20C-145-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	18	0	02/12/93	PE-1"-620-057-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	19	0	02/05/93	PE-2"-540-770-A3-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	20	0	02/04/93	PE-1 1/2"-540-781-C-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	21	0	02/08/93	PE-2"-210-161-C3-1h SHEET 01 PIPING ISOMETRIC		
H-2-126175	22	0	02/04/93	PE-1/2"-410-261-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126175	23	0	02/04/93	PE-1/2"-210-070-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126176	2	0	02/16/93	PE-1"-20C-147-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126176	4	0	02/05/93	PE-1"-170-024-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	6	0	02/04/93	PE-2"-210-160-C3-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126176	7	0	02/12/93	PE-4"-520-241-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	8	0	02/12/93	PE-1"-410-531-A-NONE SHEET 01 PIPING ISOMETRIC		
H-2-126176	9	0	02/12/93	PE-1/2"-15A-099-K-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	10	0	02/12/93	PE-1/2"-410-1342-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	11	0	02/04/93	PE-3"-520-125-A-NONE SHEET 01 PIPING ISOMETRIC		2

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CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126176	12	0	01/11/93	PE-1"-20C-018-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	13	0	02/04/93	PE-3"-520-205-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	14	0	02/04/93	PE-3"-520-209-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	15	0	02/05/93	PE-3"-520-204-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	16	0	02/05/93	PE-3"-520-112-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	17	0	02/05/93	PE-3"-520-091-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	18	0	02/05/93	PE-3"-520-116-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	19	0	02/05/93	PE-3"-520-201-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	20	0	02/05/93	PE-3"-520-096-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	22	0	02/12/93	PE-1"-620-054-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126176	23	0	02/12/93	PE-3"-520-125-A-NONE SHEET 02 PIPING ISOMETRIC		1
H-2-126177	2	0	02/16/93	PE-1"-20C-148-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126177	3	0	01/13/93	PE-3"-520-102-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	4	0	12/23/92	PE-3"-520-102-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126177	5	0	01/13/93	PE-3"-520-102-A-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126177	6	0	12/23/92	PE-3"-520-102-A-NONE SHEET 04 PIPING ISOMETRIC		2
H-2-126177	7	0	02/12/93	PE-6"-14A-101-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	8	0	02/12/93	PE-6"-14A-102-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	9	0	02/12/93	PE-1/2"-15A-104-K-Ih SHEET 01 PIPING ISOMETRIC		2
H-2-126177	10	0	02/12/93	PE-1/2"-410-979-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	11	0	01/11/93	PE-1/2"-410-768-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	12	0	01/11/93	PE-1"-20C-170-A-Ih SHEET 01 PIPING ISOMETRIC		2
H-2-126177	13	0	02/05/93	PE-1"-170-034-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	14	0	02/05/93	PE-1/2"-050-061-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	15	0	02/05/93	PE-1/2"-050-062-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	16	0	02/05/93	PE-1/2"-050-063-A-NONE SHEET 01 PIPING ISOMETRIC		2

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CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126177	17	0	02/05/93	PE-1/2"-050-064-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	18	0	01/18/93	PE-1/2"-050-065-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	19	0	02/05/93	PE-1/2"-050-068-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	20	0	02/05/93	PE-1/2"-050-069-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	21	0	02/05/93	PE-1/2"-050-070-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126177	23	0	02/12/93	PE-1"-620-055-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	2	0	02/16/93	PE-1"-20C-152-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126178	3	0	12/23/92	PE-3"-520-008-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	4	0	02/12/93	PE-1"-20C-156-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126178	5	0	02/08/93	PE-1"-20C-096-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	6	0	02/01/93	PE-1"-420-086-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126178	7	0	02/12/93	PE-1 1/2"-450-423-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	8	0	02/12/93	PE-1 1/2"-450-422-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	9	0	02/12/93	PE-1/2"-15A-106-K-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	10	0	01/11/93	PE-1/2"-410-977-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	11	0	02/12/93	PE-1/2"-410-978-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	12	0	01/11/93	PE-1 1/2"-20C-115-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	13	0	02/05/93	PE-1"-170-049-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	15	0	02/01/93	PE-3"-430-043-A3-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126178	16	0	02/01/93	PE-3"-430-043-A3-1h SHEET 02 PIPING ISOMETRIC		2
H-2-126178	18	0	02/05/93	PE-2"-460-008-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	19	0	02/12/93	PE-3"-520-068-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	20	0	02/12/93	PE-3"-520-104-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	21	0	02/12/93	PE-3"-520-083-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	22	0	02/05/93	PE-2"-230-906-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126178	23	0	02/05/93	PE-1/2"-170-067-A-NONE SHEET 01 PIPING ISOMETRIC		2

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CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126179	2	0	02/16/93	PE-1"-20C-153-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126179	3	0	02/16/93	MOG-8"-14B-030-C-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126179	4	0	02/12/93	PE-1"-20C-160-A-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126179	5	0	01/13/93	PE-2"-20C-140-A-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126179	6	0	12/12/93	PE-3"-520-242-DE-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	7	0	02/05/93	PE-2"-170-936-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	8	0	12/23/93	PE-3"-520-089-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	9	0	02/12/93	PE-1/2"-14A-033-K-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	10	0	01/11/93	PE-1/2"-410-976-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	11	0	02/12/93	PE-1"-420-089-A-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126179	12	0	01/11/93	PE-1 1/2"-20C-010-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	14	0	02/05/93	PE-1/2"-050-079-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	17	0	02/12/93	PE-3"-520-203-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	18	0	02/05/93	PE-2"-420-098-A3-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	19	0	02/05/93	PE-1/2"-210-125-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	20	0	02/05/93	PE-1/2"-210-126-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	21	0	02/05/93	PE-1/2"-210-127-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	22	0	02/05/93	PE-1"-410-1173-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126179	23	0	02/05/93	PE-1"-410-1174-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	2	0	02/12/93	PE-1"-20C-151-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126180	3	0	02/16/93	MOG-8"-14A-121-C-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126180	4	0	02/08/93	PE-1 1/2"-170-031-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	5	0	02/08/93	PE-2"-540-791-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	6	0	02/12/93	PE-1 1/2"-540-374-DE-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	7	0	02/12/93	PE-1 1/2"-540-325-DE-NONE SHEET 01 PIPING ISOMERIC		2
H-2-126180	8	0	02/01/93	PE-2"-170-937-A-NONE SHEET 01 PIPING ISOMETRIC		2

9513336.179

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126180	9	0	12/23/92	PE-3"-520-200-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	10	0	02/12/93	PE-1/2"-14A-032-K-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126180	11	0	01/13/93	PE-2"-410-1355-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	12	0	02/12/93	PE-1/2"-410-1350-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	13	0	01/11/93	PE-1 1/2"-20C-177-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	14	0	01/11/93	PE-1 1/2"-20C-177-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126180	15	0	02/05/93	PE-1"-170-046-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	17	0	02/12/93	PE-1/2"-050-060-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	18	0	02/12/93	PE-3"-520-032-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	19	0	02/01/93	PE-2"-230-907-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	22	0	02/01/93	PE-1/2"-170-017-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126180	23	0	02/12/93	PE-1/2"-050-072-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	2	0	02/12/93	PE-1"-20C-141-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126181	3	0	02/16/93	PVV-10"-15G-030-C-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126181	4	0	02/08/93	PE-1"-170-025-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	5	0	01/13/93	PE-2"-20C-015-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	6	0	02/05/93	PE-2"-20C-186-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	7	0	02/01/93	PE-2"-170-938-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	8	0	12/23/93	PE-3"-520-199-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	9	0	02/12/93	PE-1/2"-14A-031-K-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	10	0	01/11/93	PE-1/2"-410-1341-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	11	0	02/12/93	PE-1/2"-410-964-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	12	0	02/05/93	PE-2"-540-769-A3-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	13	0	01/11/93	PE-1"-210-121-C3-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	14	0	02/08/93	PE-1"-210-122-C3-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	15	0	02/05/93	PE-2"-170-044-A-NONE SHEET 01 PIPING ISOMETRIC		2

9513336.180

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126181	16	0	02/05/93	PE-1/2"-050-077-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	17	0	02/12/93	PE-1/2"-050-058-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	18	0	02/05/93	PE-2"-16A-051-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	19	0	02/05/93	PE-1/2"-170-068-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	20	0	02/12/93	PE-1/2"-050-071-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	21	0	02/12/93	PE-1/2"-050-073-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	22	0	02/08/93	PE-2"-170-909-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126181	23	0	02/05/93	PE-2"-170-908-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	2	0	02/12/93	PE-1"-20C-142-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126182	3	0	02/16/93	PVV-14"-14A-071-C-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126182	4	0	02/08/93	PE-1"-170-026-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	6	0	02/08/93	PE-1"-170-050-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	7	0	02/08/93	PE-2"-170-939-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	8	0	01/13/93	PE-3"-520-007-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	9	0	01/13/93	PE-3"-520-073-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	10	0	02/12/93	PE-1/2"-14A-030-K-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126182	11	0	01/11/93	PE-1/2"-410-973-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	12	0	02/12/93	PE-1/2"-410-963-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	13	0	01/11/93	PE-1 1/2"-20C-178-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	14	0	01/11/93	PE-1/1/2"-20C-178-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126182	15	0	02/08/93	PE-1"-170-045-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	16	0	02/08/93	PE-1/2"-050-078-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	17	0	02/12/93	PE-1/2"-050-059-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	18	0	02/08/93	PE-2"-16A-052-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	19	0	02/08/93	PE-1/2"-170-019-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	20	0	02/08/93	PE-2"-170-905-A-NONE SHEET 01 PIPING ISOMETRIC		2

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CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126182	21	0	02/08/93	PE-2"-170-910-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	22	0	02/08/93	PE-2"-170-907-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126182	23	0	02/08/93	PE-4"-500-067-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	2	0	02/12/93	PE-1"-20C-143-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126183	3	0	02/16/93	PVV-14"-15B-002-C-1H SHEET 01 PIPING ISOMETRIC		2
H-2-126183	4	0	02/08/93	PE-1"-170-028-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	5	0	02/02/93	PE-2"-520-234-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	6	0	02/02/93	PE-2"-520-234-DD-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126183	7	0	02/02/93	PE-2"-520-234-DD-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126183	8	0	02/02/93	PE-2"-520-234-DD-NONE SHEET 04 PIPING ISOMETRIC		2
H-2-126183	9	0	02/02/93	PE-2"-520-234-DD-NONE SHEET 05 PIPING ISOMETRIC		2
H-2-126183	10	0	02/02/93	PE-3"-520-234-DD-NONE SHEET 06 PIPING ISOMETRIC		2
H-2-126183	11	0	02/12/93	PE-1/2"-410-994-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	12	0	02/12/93	PE-1/2"-410-995-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	13	0	01/11/93	PE-1/2"-410-972-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	14	0	02/12/93	PE-1"-480-711-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	15	0	02/08/93	PE-1"-170-052-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	16	0	02/08/93	PE-1/2"-050-076-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	17	0	02/12/93	PE-3"-520-113-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	18	0	02/12/93	PE-3"-520-113-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126183	19	0	02/12/93	PE-3"-520-113-A-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126183	20	0	02/08/93	PE-2"-710-951-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	21	0	02/08/93	PE-1"-480-916-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126183	23	0	02/05/93	PE-1"-420-088-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126184	2	0	02/12/93	PE-1"-20C-144-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126184	3	0	02/16/93	PVV-14"-15A-003-C-1H SHEET 01 PIPING ISOMETRIC		2

9513336.1182

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126184	4	0	02/09/93	PE-1"-170-033-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	5	0	02/09/93	PE-2"-540-792-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	6	0	02/09/93	PE-1"-170-047-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	7	0	02/12/93	PE-1 1/2"-14A-089-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	8	0	02/12/93	PE-1 1/2" 14A-090-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	9	0	02/12/93	PE-2"-560-026-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	10	0	01/11/93	PE-1/2"-410-1203-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	11	0	02/12/93	PE-1/2"-210-085-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	12	0	01/11/93	PE-1 1/2"-20C-027-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	13	0	01/11/93	PE-1 1/2"-20C-027-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126184	14	0	02/09/93	PE-1"-170-029-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	15	0	02/08/93	PE- 1/2"-050-074-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	16	0	02/12/93	PE-3"-520-072-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	17	0	02/09/93	PE-2"-420-087-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126184	18	0	02/08/93	PE-2"-710-915-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	19	0	02/08/93	PE-2"-710-952-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126184	20	0	02/12/93	PE-1"-20C-173-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126184	21	0	02/12/93	PE-1"-20C-173-A-1h SHEET 02 PIPING ISOMETRIC		2
H-2-126184	22	0	02/12/93	PE-1"-20C-173-A-1h SHEET 03 PIPING ISOMETRIC		2
H-2-126184	23	0	02/12/93	PE-1"-20C-026-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	2	0	02/12/93	PE-1"-20C-149-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126185	4	0	02/08/93	PE-1"-170-035-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	5	0	02/09/93	PE-2"-540-793-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	6	0	02/09/93	PE-1"-170-048-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	7	0	02/12/93	PE-1"-420-094-A-1h SHEET 01 PIPING ISOMETRIC		2
H-2-126185	8	0	01/11/93	PE-2"-410-226-A-NONE SHEET 01 PIPING ISOMETRIC		2

9513336.1183

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126185	9	0	01/11/93	PE-1"-410-1364-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	10	0	01/11/93	PE-1/2"-410-1202-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	11	0	02/12/93	PE-1"-20C-024-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	12	0	02/12/93	PE-1"-20C-024-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126185	13	0	02/09/93	PE-1"-170-023-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	14	0	02/09/93	PE-1/2"-050-075-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	15	0	02/12/93	PE-3"-520-192-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	16	0	02/12/93	PE-3"-520-054-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	17	0	02/08/93	PE-2"-710-916-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	18	0	02/08/93	PE-1"-20C-185-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	19	0	02/12/93	PE-1"-620-059-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	20	0	02/12/93	PE-1"-620-058-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126185	21	0	02/12/93	PE-1/2"-20C-161-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	2	0	02/12/93	PE-1"-20C-146-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126186	4	0	02/08/93	PE-1 1/2"-170-032-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	5	0	02/09/93	PE-1 1/2"-170-051-DH-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	6	0	01/13/93	PE-3"-520-208-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	7	0	01/13/93	PE-3"-520-208-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126186	8	0	01/13/93	PE-3"-520-208-A-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126186	9	0	01/13/93	PE-3"-520-208-A-NONE SHEET 04 PIPING ISOMETRIC		2
H-2-126186	10	0	01/13/93	PE-3"-520-208-A-NONE SHEET 05 PIPING ISOMETRIC		2
H-2-126186	11	0	12/23/92	PE-3"-520-208-A-NONE SHEET 06 PIPING ISOMETRIC		2
H-2-126186	12	0	12/23/92	PE-3"-520-208-A-NONE SHEET 07 PIPING ISOMETRIC		2
H-2-126186	13	0	12/23/92	PE-3"-520-208-A-NONE SHEET 08 PIPING ISOMETRIC		2
H-2-126186	14	0	12/23/92	PE-3"-520-208-A-NONE SHEET 09 PIPING ISOMETRIC		2
H-2-126186	15	0	02/08/93	PE-3"-520-208-A-NONE SHEET 10 PIPING ISOMETRIC		2

951336.184

CWBS B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126186	16	0	02/12/93	PE-1"-210-086-A NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	17	0	02/08/93	PE-3"-520-208-A-NONE SHEET 11 PIPING ISOMETRIC		2
H-2-126186	18	0	02/09/93	PE-3"-520-208-A-NONE SHEET 12 PIPING ISOMETRIC		2
H-2-126186	19	0	02/12/93	PE-3"-520-085-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	21	0	02/12/93	PE-1/2"-410-1344-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	22	0	02/12/93	PE-1"-620-244-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126186	23	0	02/12/93	PE-1"-20C-026-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126187	1	0	02/16/93	PE-6"-520-067-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	4	0	02/12/93	PE-6"-520-067-DD-NONE SHEET 04 PIPING ISOMETRIC		2
H-2-126187	5	0	02/12/93	PE-6"-520-067-DD-NONE SHEET 05 PIPING ISOMETRIC		2
H-2-126187	6	0	02/12/93	PE-3"-520-067-DD-NONE SHEET 06 PIPING ISOMETRIC		2
H-2-126187	7	0	02/12/93	PE-3"-520-067-DD-NONE SHEET 07 PIPING ISOMETRIC		2
H-2-126187	8	0	02/12/93	PE-3"-520-067-DD-NONE SHEET 08 PIPING ISOMETRIC		2
H-2-126187	10	0	01/11/93	PE-1/2"-410-1201-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	11	0	02/12/93	PE-1/2"-20C-155-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	12	0	02/09/93	PE-1"-170-027-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	13	0	02/08/93	PE-2"-170-039-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	14	0	02/08/93	PE-1 1/2"-230-003-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	15	0	02/12/93	PE-3"-520-103-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	16	0	02/12/93	PE-3"-520-117-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	17	0	02/12/93	PE-3"-520-117-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126187	18	0	02/08/93	PE-1/2"-170-066-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	19	0	02/08/93	PE-2"-540-794-DD-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	20	0	02/08/93	PE-2"-540-794-DD-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126187	21	0	02/08/93	PE-1"-620-014-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126187	22	0	02/08/93	PE-1"-620-015-A-NONE SHEET 01 PIPING ISOMETRIC		2

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CW8S B210A PIPING ISOMETRIC INDEX VITRIFICATION BUILDING

DRAWING NUMBER	SHEET NUMBER	DRW REV	REV DATE	LINE NUMBER, CLASS, AND SHEET NUMBER	REMARKS	RD REV
H-2-126187	23	0	02/12/93	PE-1"-20C-026-A-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126188	1	0	02/12/93	PE-3"-520-115-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	2	0	02/16/93	PE-3"-520-115-A-NONE SHEET 02 PIPING ISOMETRIC		2
H-2-126188	3	0	02/12/93	PE-3"-520-115-A-NONE SHEET 03 PIPING ISOMETRIC		2
H-2-126188	4	0	02/12/93	PE-3"-520-115-A-NONE SHEET 04 PIPING ISOMETRIC		2
H-2-126188	5	0	02/12/93	PE-3"-520-115-A-NONE SHEET 05 PIPING ISOMETRIC		2
H-2-126188	7	0	02/08/93	PE-1/2"-410-974-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	8	0	01/11/93	PE-1/2"-410-975-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	9	0	01/11/93	PE-1/2"-410-1333-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	10	0	01/13/93	PE-1 1/2"-410-1365-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	11	0	02/09/93	PE-1"-170-038-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	12	0	02/08/93	PE-1/2"-170-037-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	13	0	02/08/93	PE-1 1/2"-230-007-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	14	0	02/08/93	PE-1 1/2"-230-006-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	15	0	02/12/93	PE-1"-620-056-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	16	0	02/12/93	PE-4"-520-114-00-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	17	0	02/12/93	PE-3"-520-084-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	19	0	02/08/93	PE-1"-170-042-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	20	0	02/09/93	PE-1/2"-170-016-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	21	0	02/08/93	PE-1"-620-050-A-NONE SHEET 01 PIPING ISOMETRIC		2
H-2-126188	22	0	02/08/93	PE-1"-620-051-A-NONE SHEET 01 PIPING ISOMETRIC		2

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SECTION 05560
EMBEDDED WALL PENETRATIONS
B-595-C-B210A-05560

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	___	NO	X
QUALITY LEVEL	I	___	II	X
SAFETY CLASS	1	___	2	___
			3	X
			4	___

ORIGINATOR:

CHECKER:

L. S. Davis 7/8/93
L. S. Davis, Mechanical Engineer Date

D. A. Buzzelli 7-8-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

SECTION 05560
 EMBEDDED WALL PENETRATIONS
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ATTACHMENTS

<u>ATTACHMENT</u>	<u>TITLE</u>
A	CONTRACT DRAWINGS

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**SECTION 05560
EMBEDDED WALL PENETRATIONS**

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the technical requirements for the fabrication, testing, inspection, cleaning and packaging of embedded wall penetrations.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.5M 1982 Dimensioning and Tolerancing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M 1991 Standard Specification for Structural Steel

ASTM A53 1990 Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless

ASTM A182/A182M 1991 Standard Specification for Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

ASTM A240 1991 (Rev. A) Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

ASTM A262 1991 Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

ASTM A276 1990 (Rev. A) Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

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ASTM A312/A312M 1991 (Rev. B) Standard Specification for
Seamless and Welded Austenitic Stainless
Steel Pipe

ASTM A530/A530M 1991 (Rev. A) Standard Specification for
General Requirements for Specialized
Carbon and Alloy Steel Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3 1990 (Addendum a and b) Chemical Plant and
Petroleum Refinery Piping

1.3 RELATED REQUIREMENTS

Specification Section 05059 Welding - Stainless Steel Liners

Specification Section 05062A Welding - Piping

Specification Section 05062B Welding - Piping

Specification Section 05123 Miscellaneous Metals

Specification Section 09875 Priming of Steel

Specification Section 13252 Precautions for Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys

Specification Section 15196 Identification and Tagging Methods
For Mechanical Equipment

CONTRACT DRAWINGS

Drawings as listed in Attachment A.

1.4 DEFINITIONS

CMTR - Certified Material Test Report

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

- 1.6.1 Material verification shall be submitted in accordance with Paragraph 2.1.2. Certified Material Test Reports (CMTRs) shall be submitted for Buyer review.
- 1.6.2 Shop drawings shall be submitted for Buyer approval in accordance with Paragraph 2.2.1.
- 1.6.3 Verification of proof testing shall be submitted in accordance with Paragraph 2.2.5.C. Inspection reports shall be submitted for Buyer review.
- 1.6.4 As-built weight for each assembly shall be submitted.
- 1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS
(Not Used)
- 1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS
(Not Used)

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
 - 2.1.1 Embedded wall penetrations shall be provided. These penetrations shall be fabricated in accordance with the corresponding drawing listed in Attachment A.
 - 2.1.2 Except as noted, embedded wall penetrations shall be Type 304L stainless steel in accordance either with ASTM A182/A182M, ASTM A240, ASTM A276 or ASTM A312/A312M as applicable. Wall plates for H-2-120037 and H-2-120061 shall be in accordance with ASTM A36/A36M. Pipe for H-2-120061 shall be Grade B in accordance with ASTM A53. Seller shall verify that materials are in accordance with these standards.
 - 2.1.3 The exposed cell side of all stainless steel embedment plates shall be finished in accordance with Specification Section 05123.
 - 2.1.4 Stainless steel shall be protected during storage and fabrication in accordance with Specification Section 13252.
 - 2.1.5 Corrosion Evaluated Material (CEM) Requirements
 - 2.1.5.1 Material that is in contact with process fluid requires CEM testing.

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2.1.5.2 Type 304L SS material shall be CEM when indicated on the Contract Drawing. Testing shall be in accordance with ASTM A262, Practice C. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.002 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material is acceptable. Typical CMTRs are not acceptable.

2.1.5.3 Secondary containment piping does not require CEM.

2.1.5.4 Weld filler metal does not require CEM testing.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Seller shall prepare shop fabrication drawings. These drawings shall be in accordance both with the equipment requirement drawings and this specification section. Dimensioning and tolerancing shall be in accordance with ANSI Y14.5M. All shop drawings shall be submitted for Buyer approval before fabrication begins.

2.2.2 All welding shall be performed in accordance with Specification Section 05059, Specification Section 05062A or Specification Section 05062B. Welds shall be ground smooth and blended in with the base metal as shown on drawings.

2.2.3 Specific weld requirements shall be shown on the Seller's shop fabrication drawings.

2.2.4 All welds shall be visually inspected in accordance with Specification Section 05059, Specification Section 05062A or Specification Section 05062B.

2.2.4.1 All embed plate penetrations shall be seal welded on the cell side as shown on drawings. Welds shall be liquid penetrant examined in accordance with Specification Section 05059, Specification Section 05062A or Specification Section 05062B.

2.2.5 Special Requirements - Item H-2-120060-010.

- A. Bending radius shall be not less than 24 inches. Pipe section at all locations shall be in accordance with ASTM A530/A530M. Bends shall be free of wrinkles and flat spots.
- B. Pipe couplings shall only be used where necessary. These couplings shall be modified socket weld couplings. Couplings shall not be installed on any pipe bend. One end of each pipe shall have a coupling welded to it.

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- C. Seller shall pressure test every pipe weld in accordance with ASME B31.3. The test pressure shall be 20 psig. All piping shall allow passage of the test rabbit without interference.

2.3 CLEANING

All embedded penetration components shall be thoroughly cleaned. All water, sand, grit, weld spatter, grease, oil and other foreign materials shall be removed before shipment preparation begins. Equipment shall be delivered in a clean, rust-free condition. Carbon steel components shall be primed in accordance with Specification Section 09875.

2.4 LABELING

Labeling and identification shall be in accordance with Specification Section 15196, Paragraph 2.2.2, Type 10.

2.5 PACKAGING

Packaging and preparation for shipment shall be in accordance with Seller's standard packaging procedure. At minimum, packaging shall provide protection against corrosion and damage from normal handling and storage in an unheated warehouse.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION and ERECTION

3.2.1 Special Requirements - Item H-2-120060-010.

After erection and pipe welding, Seller shall pressure test every pipe weld in accordance with ASME B31.3. The test pressure shall be 20 psig. Test shall be performed before concrete is poured. All couplings shall be X-rayed to verify gap between pipe and coupling shoulder.

3.3 SHOP QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

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3.5 CLEANING

3.5.1 Special Requirements - Item H-2-120060-010.

All embedded tube penetration components shall be thoroughly cleaned after pressure tests are completed. All water, sand, grit, weld spatter, grease, oil and other foreign materials shall be removed. Water removal shall be in accordance with Specification Section 13252.

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

3.7.1 Special Requirements - Item H-2-120060-010.

Seller shall demonstrate that the test rabbit can pass through the entire assembly without interference. This test shall be performed after cleaning is completed. Pressure of the compressed air used for this test shall not exceed 5 psig.

3.8 SCHEDULES

(Not Used)

END OF SECTION

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**ATTACHMENT A
CONTRACT DRAWINGS**

DRAWING NUMBER	DRAWING TITLE
H-2-120002	Mech. Vit. Bldg. Embedded Tube MSM Bag Type Assembly
H-2-120037	EB-710-100 Embedded Tube Plug Delivery System Assembly
H-2-120060	Mech. Vit. Bldg. Embedded Piping Sampling Rabbit System Assembly
H-2-120061	EB-710-102 Embedded Tube Smear Test Exit Tunnel Assembly
H-2-120073	GEP-0047-17 MC-ICC Elec. Conn Inr Cstr Closure Assembly
H-2-120141	EB-710-104 Embed Tube Crn Rtrv Sys Smear Test Exit Tnl
H-2-120241	GEP-0044-02 MC/CDC Trans Tunnel Sump Prcs Conn Assembly
H-2-120244	Mech Sgl 2" PUREX Prcs Conn for SST Lined Cell Assembly
H-2-120245	GEP-0047-18 MC-ICC Prcs Conn Inr Cstr Closure Assembly
H-2-120461	EB-710-107 REDC Radiation Detector Embed Assembly
H-2-120501	Mechanical Extended Single 2" PUREX Prcs Conn Assy.
H-2-120522	Mechanical SGL 2" PUREX Prcs Conn for Unlined Cell Assy

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SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND
STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS
B-595-C-B210A-13252

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	___	NO	<u>X</u>
QUALITY LEVEL	I	___	II	<u>X</u>
SAFETY CLASS	1	___	2	___
	3	<u>X</u>	4	___

ORIGINATOR(S):

CHECKER(S):

A. Estrada 7/8/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 7-8-93
D. A. Buzzelli, Lead Disc. Checker Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

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Richland, Washington
DOE Contract DE-AC06-86RL10838

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SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND
STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS
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**SECTION 13252
PRECAUTIONS FOR FABRICATION, HANDLING AND
STORAGE OF STAINLESS STEEL AND NICKEL ALLOYS**

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the technical requirements for handling, fabrication, shipment and storage of stainless steel and nickel alloys to minimize the risk of contaminating compounds.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME N45.2.1 1980 Cleaning of Fluid Systems and
Associated Components for Nuclear Power
Plants

Boiler and Pressure Vessel Code

ASME Section V 1989 Nondestructive Examination

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A380 1978 Standard Practice for Cleaning and
Descaling Stainless Steel Parts,
Equipment, and Systems

ASTM D129 1991 Standard Test Method for Sulfur in
Petroleum Products (General Bomb Method)

ASTM D808 1991 Standard Test Method for Chlorine in
New and Used Petroleum Products (Bomb
Method)

ASTM D1552 1990 Standard Test Method for Sulfur in
Petroleum Products (High Temperature
Method)

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CODE OF FEDERAL REGULATIONS (CFR)

40 CFR, Ch. 1

1990 National Secondary Drinking Part 143
Water Regulations

1.3 RELATED REQUIREMENTS

(Not Used)

1.4 DEFINITIONS

Contaminating Compounds	- Carbon Steel, Sulfur, Chlorides and Low-Melting Point Metals
MIC	- Microbiological Influenced Corrosion
ppm	- Parts Per Million
SCC	- Stress Corrosion Cracking

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Seller's procedure for handling, cleaning, isolation and storage of stainless steel and nickel alloys shall be submitted for Buyer approval. These procedures shall be submitted prior to the start of fabrication.

1.6.2 Chemical analyses shall be submitted for materials that are not intended to be removed after fabrication. Examples of these materials are: lubricants, thread compound, etc. Submit for Buyer review.

1.6.3 Seller's procedure for drying of piping shall be submitted for Buyer approval. The procedure shall identify the means of verifying that all water has been dried from pockets and low points after hydrostatic testing. Drying gas quality shall also be specified in procedures.

1.6.4 Biocide water treatment procedures shall be submitted for Buyer approval.

1.6.5 Water chemistry and biocide material data sheet shall be submitted for Buyer approval. This information shall be submitted prior to hydrostatic testing.

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1.6.6 Procedure for the isolation and separation of stainless steel wire brushes and grinding material shall be submitted for Buyer approval.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 All limitations specified, e.g., percent, parts per million (ppm), etc., are to be by weight.

2.1.2 All consumables and materials used during fabrication shall meet the following general requirements unless addressed in more detail in this specification section.

2.1.2.1 Maximum chloride content shall be 250 ppm.

2.1.2.2 Maximum sulfur content shall be 1 percent.

2.1.2.3 Low melting point elements (such as cadmium, lead, mercury, tin and zinc) shall not be added.

2.1.3 Carbon Steel Contamination

2.1.3.1 Tools and equipment used to cut, form and handle stainless steel and nickel alloys shall be in accordance with one of the following requirements:

A. Tools and equipment shall be hardened tool steel or chrome plated.

B. Surfaces of non-stainless steel tools and equipment which comes into contact with stainless steel shall be covered either with paper, plastic or stainless steel sheet.

2.1.3.2 Grinding stainless steel wire brushes previously used on carbon steel shall not be used on stainless steel and nickel alloys.

2.1.3.3 Temporary attachments for welding or fabrication shall be of a similar grade material (e.g., 300 series stainless steel shall be used for a temporary attachment to 304L stainless steel) to the pressure component.

- 2.1.3.4 If scaffolding or ladders are used during fabrication, the contact surfaces at the stainless steel or nickel alloy interface shall be protected either by wood or plastic. No direct contact shall be permitted.
- 2.1.3.5 Areas used for fabrication of stainless steel and nickel alloys shall be separate from carbon steel fabrication areas. These areas shall be kept free of carbon steel shavings and grinding dust.
- 2.1.3.6 Where it is not possible to provide protection from carbon steel, the components shall be chemically cleaned to dissolve any carbon steel which may be embedded in the stainless steel or nickel alloy surface. The acceptable amount of contamination and cleaning requirements shall be in accordance with Paragraph 2.1.3.10.
- 2.1.3.7 Non-metallic slings shall be used when safe to do so. Lifting with carbon steel chains from lifting lugs is acceptable. Chemically clean lugs prior to shipment of equipment. Cleaning shall be in accordance with Paragraph 2.1.3.6.
- 2.1.3.8 Carbon steel strapping material used for shipping shall not contact stainless steel or nickel alloy equipment or piping.
- 2.1.3.9 Walking directly upon stainless steel surfaces shall be prohibited where possible. Surfaces upon which walking access is required shall be protectively covered with kraft paper, cardboard, plastic or equivalent.
- 2.1.3.10 Acceptable Carbon Steel Contamination
- A. Scattered areas of carbon steel contamination (as evident by rust) are permissible provided the aggregate area does not exceed 2 sq. in. in any 1 sq. ft. area. Verification shall be in accordance with ASTM A380.
 - B. Surfaces that are found to be contaminated with carbon steel shall be restored. Mechanical or chemical descaling is acceptable. Descaling shall be in accordance with ASTM A380.
- 2.1.4 Wrapping and Protective Covering Materials
- 2.1.4.1 No chloride restriction shall apply to wrapping and protective covering material (such as polyethylene and polyvinyl chloride (PVC) films) when used for packaging or storage purposes. PVC caps, plugs and packaging material shall not be reused.
- 2.1.4.2 No chloride restriction shall apply to pressure-sensitive tapes or adhesive-backed tapes. Pressure-sensitive tapes or adhesive-backed tapes shall not be used within 12 inches of any

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area where local heating or welding may increase the metal temperature to 180°F or higher.

2.1.4.3 Where tape is used during welding for back purging, the tape shall be of a low-chloride (less than 250 ppm) type (Stockwell Rubber Company G-568 or equal).

2.1.4.4 After pressure-sensitive and adhesive-backed tapes are no longer required they shall be removed. Any remaining residual adhesive shall be removed. Acetone or solvent shall be used. Solvent shall be in accordance with Paragraph 2.1.7.

2.1.5 Grinding Discs, Abrasive Discs, Brushes and Material Removal Tools

2.1.5.1 Grinding discs, abrasive discs and brushes shall be designated for use on stainless steel and nickel base alloys. These materials shall not have been previously used on carbon steel, low alloy steels or nonferrous metals and their alloys.

2.1.5.2 Grinding discs, abrasive discs and belts shall be of resin-bonded alumina, silicon carbide or zirconium carbide. Sulfurized compounds shall not be used as a bonding material.

2.1.5.3 Only 300 series stainless steel brushes shall be used on stainless steel and nickel base alloys.

2.1.5.4 All material removal and cleaning tools shall be marked to identify that they are to be used on stainless steel and nickel alloys only.

2.1.6 Nondestructive Examination Materials

Sulfur and halogen content of liquid penetrant materials shall be in accordance with the requirements of ASME Section V, Article 6, T-625.

2.1.7 Cleaning Fluids

Chlorinated hydrocarbon solvents may be used for stainless steel cleaning provided they are analyzed for total residual chlorine and sulfur. The analysis process is as follows:

- A. Select and weigh a glass Petri dish of 150mm nominal diameter. Note the weight.
- B. Pour a 100-gram sample of the solvent into the Petri dish.
- C. Heat the sample for 60 minutes. The heating temperature shall be between 194°F and 212°F, inclusive.

- D. Weigh the Petri dish again. Subtract the weight noted in Step A from the new weight. This is the weight of the solvent residue.
- 1) If the residue is less than 0.005 grams, the solvent is acceptable. No further analysis is required.
 - 2) If the residue weight is 0.005 grams or more, repeat Steps A through C. Test the residue in accordance with ASTM D129 or ASTM D1552 for sulfur content. Test the residue in accordance with ASTM D808 for halogen content.

The sulfur or chlorine content shall not exceed 1 percent of the residue by weight in any case.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Hydrostatic Test Water Quality

The intent of the following guidelines is to minimize the risk of chloride stress corrosion cracking (SCC) and microbiological influenced corrosion (MIC).

2.2.2 Water quality shall meet the following requirements for equipment and piping that can be drained and completely dried or when specified by the Contract Documents.

2.2.2.1 Water used for testing shall be clean, filtered, chlorinated water. The free residual chlorine content of this water shall not be more than 0.1 ppm. It shall be in accordance with the following water chemistry and requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 35 ppm.
- C. Fluoride content shall be less than 5 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Total dissolved solids shall be less than 500 ppm.
- F. Treated with a biocide for the specific normal population of bacteria.

Potable water which meets the Code of Federal Regulations 40 CFR, Chapter 1, Part 143 requirements should satisfy these chemistry limits.

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The test water shall be analyzed before equipment and piping are filled. The water's free residual chlorine content shall be determined.

2.2.2.2 Test water and piping surface temperature shall not exceed 140°F at any time during hydrostatic test or drying operations. If a temperature in excess of 140°F is necessary to dry equipment or piping, deionized water shall be used. Deionized water shall meet the requirements of Paragraph 2.2.3.

2.2.2.3 Piping shall be completely drained and dried within 72 hours of hydrostatic testing. Acceptable methods of drying include mopping, wiping or blow drying with cool (less than 140°F) air or nitrogen. Seller shall submit a drying procedure in accordance with Paragraph 1.6.3.

2.2.3 Deionized water shall be used for hydrostatic testing of piping that can only be dried through evaporation or when specified in Contract Documents. The water and methods shall be in accordance with the following paragraphs:

2.2.3.1 Deionized water shall meet the following requirements:

- A. pH at 77°F shall be 5.5 to 8.0.
- B. Chloride content shall be less than 1 ppm.
- C. Fluoride content shall be less than 1 ppm.
- D. Sulfide content shall be less than 1 ppm.
- E. Conductivity at 77°F shall not exceed 3 micromho/cm.
- F. Silica content shall not exceed 0.05 ppm.
- G. Total suspended solids shall not exceed 3 ppm.
- H. Treated with a biocide for the specific normal population of bacteria.

Steam condensate or demineralized water should satisfy the above requirements. The above water chemistry requirements are in accordance with ASME N45.2.1.

The test water shall be analyzed before piping is filled.

2.2.3.2 Piping shall be sealed and maintained in clean condition once testing is complete.

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- 2.2.3.3 Any hydrostatic test condition or procedure not addressed by the above paragraphs shall be submitted for Buyer approval prior to the start of testing.
- 2.2.4 Extended Hydrostatic Test
- 2.2.4.1 If piping is subjected to extended hydrostatic test or wet layup condition (greater than 72 hours) the test water shall be analyzed for microbiological contamination. An acceptable biocide test kit shall be used (Bioindustrial Technologies Incorporated - MICKITTM or equal).
- 2.2.4.2 If necessary, the water shall be treated on a daily basis with a biocide to minimize the risk of microbiological contamination. Examples of acceptable biocides are chlorine (0.2 ppm) and hydrogen peroxide. Seller shall select the proper biocide according to the analyzed water chemistry. Seller shall submit a material data sheet on the intended biocide.
- 2.2.5 Cleaning Requirements
- All surfaces to be welded shall be free of paint, oil, grease, dirt and other foreign materials detrimental to the weld soundness. An area 4 inches wide minimum on each side of weld joint shall be cleaned. Acceptable cleaning methods shall be mechanical or chemical methods in accordance with ASTM A380.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

- 3.2.1 After welding all foreign materials such as flux, anti-spatter compound, slag and spatter shall be removed. Removal can be accomplished either by mechanical or chemical methods.
- 3.2.2 Heat tint (dark blue coloring) and scale shall be permitted on nonprocess side of weld joint. Light heat tint (straw or gold colored) shall be permitted on process side of weld joint. When required, heat tint and scale can be removed either by mechanical or chemical descaling methods. For mechanical descaling, precleaning and postcleaning is required.
- 3.2.3 Liquid penetrant and ultrasonic examination materials shall be completely removed from surface after examination. Removal shall be in accordance both with manufacturer's recommendation and this specification section.

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3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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SECTION 05123
MISCELLANEOUS METALS
B-595-C-B210A-05123

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972 & CR-0902
ISSUE DATE 7/14/93

WAPA YES NO X
QUALITY LEVEL I X II
SAFETY CLASS 1 2 3 X 4

ORIGINATOR:

M. S. Whitten 7/13/93
M. S. Whitten, Structural Engineer Date

CHECKER:

E. Jorgensen 7-13-93
E. Jorgensen, Structural Engineer Date

APPROVED BY:

M. S. Whitten
M. S. Whitten Lead Discipline Engineer

7/13/93
Date

JUL 15 1993

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SECTION 05123
MISCELLANEOUS METALS
B-595-C-B210A-05123

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SECTION 05123
MISCELLANEOUS METALS

PART 1 GENERAL

1.1 SUMMARY

This section covers the technical requirements for the furnishing, fabrication, delivery, installation and inspection of miscellaneous carbon and stainless steel embedded into concrete.

1.2 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S302 1986 Code of Standard Practice for Steel
Buildings and Bridges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36/A36M 1990 Standard Specification for Structural
Steel

ASTM A53 1990 Standard Specification for Pipe,
Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless

ASTM A108 1990 Standard Specification for Steel
Bars, Carbon, Cold-Finished, Standard
Quality

ASTM A240 1991 Standard Specification for Heat-
Resisting Chromium and Chromium-Nickel
Stainless Steel Plate, Sheet and Strip for
Pressure Vessels

ASTM A262 1991 Standard Practices for Detecting
Susceptibility to Intergranular Attack in
Austenitic Stainless Steels

ASTM A276 1990 Standard Specification for Stainless
and Heat-Resisting Steel Bars and Shapes

ASTM A312/A312M 1991 Standard Specification for Seamless
and Welded Austenitic Stainless Steel
Pipes

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ASTM A446	1989 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A480/A480M	1991 General Requirements for Flat-Rolled Stainless Heat-Resisting Steel Plate, Sheet and Strip
ASTM A484/A484M	1991 Standard Test Methods for General Requirements for Stainless and Heat-Resisting Bars, Billets and Forgings
ASTM A494	1991 (Rev. A) Standard Specification for Castings, Nickel and Nickel Alloy
ASTM A496	1990 (Rev. A) Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
ASTM A525	1987 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements
ASTM A770/770M	1986 Standard Specification for Through-Thickness Tension Testing of Steel Plates for Special Applications
ASTM G28	1985 Test Methods of Detecting Susceptibility to Intergranular Attack in Wrought, Nickel-Rich, Chromium-Bearing Alloys

1.3 RELATED REQUIREMENTS

Specification Section 03252	Concrete Anchors
Specification Section 05059	Welding - Stainless Steel Liners
Specification Section 09875	Priming of Steel
Specification Section 13252	Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys

1.4 DEFINITIONS

- 1.4.1 The integral method of liner plate installation utilizes the liner plate as permanent forms for concrete placement.

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1.4.2 The wallpaper method of liner plate installation utilizes embeds in previously placed concrete to fasten the liner plate.

1.4.3 A containment boundary weld is a weld located such that in the final installation, it will be exposed to the room interior.

1.5 **SYSTEM DESCRIPTION**

(Not Used)

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certified Material Test Reports (CMTRs) demonstrating material conformance to all the noted ASTM and AWS requirements identified in Paragraph 2.1.

1.6.2 Sample of stainless steel plate for liner for acceptance of finish specified in Paragraph 2.1.2.1.

1.6.3 Shop and erection drawings meeting the requirements of Paragraph 2.2.1.1.

1.6.4 Documentation of quality control and inspection procedures in accordance with Paragraph 3.3.1.

1.6.5 Records of certification and test reports in accordance with Paragraph 3.3.1.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Carbon Steel Materials

2.1.1.1 Structural steel members (shapes, bars, and plate): ASTM A36.

Plates exceeding 2 inches thick shall have through-thickness (Z-direction) tension tests performed and submitted in accordance with ASTM A770. The material shall meet the acceptance standards of Section 5 and marking per Section 6 of ASTM A770. The Carbon Equivalent value shall also be determined and furnished.

2.1.1.2 Pipe: ASTM A53, Type E or Type S, Grade B.

2.1.1.3 Welded studs: Nelson Type S3L or H4L or equal conforming to ASTM A108 Grades C-1010 through C-1020 (low carbon cold drawn steel), with a minimum ultimate tensile stress capacity of 55,000 psi, or Nelson Type D2L deformed bar anchors or equal conforming to ASTM A496 with a minimum ultimate tensile stress capacity of 80,000 psi. Length of studs or anchors shall be as specified on the Contract Drawings. Weld the studs and anchors per manufacturer's recommendations.

2.1.1.4 Floor plates: Floor plate shall be skid resistant raised pattern carbon steel plate, 1/4 inch thick excluding the height of the raised pattern. The plate material shall have a minimum yield stress of 33000 psi.

2.1.1.5 Paint and coatings: Specification Section 09875, Priming of Steel.

2.1.1.6 Weld materials: Specification Section 05059, Welding-Stainless Steel Liners. Low hydrogen welding electrodes with a tensile strength of 70,000 psi. Electrodes shall be compatible with the welding process and materials being welded.

2.1.1.7 Bolts, nuts and washers: See Specification 03252 - Concrete Anchors for Carbon Steel Materials.

2.1.2 Stainless Steel Materials

2.1.2.1 Plate: ASTM A240, Type 304L; hot rolled, solution annealed, surface cleaned and polished to a No. 4 finish in accordance with ASTM A480/A480M on exposed side of plate.

2.1.2.2 Bars and shapes: ASTM A276, Type 304L ($F_y = 25$ ksi); hot finished, condition A for bars; hot finished, Class A or C in accordance with ASTM A484/A484M for shapes.

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2.1.2.3 Stainless steel material specified on the Contract Drawings for corrosion evaluation, shall be tested in accordance with ASTM A262 Practice C. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.002 inches/month. Material passing Practice A, the Rapid Screening Test, is considered acceptable. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material is acceptable. Typical CMTRs are not acceptable.

2.1.2.4 Pipe: ASTM A312, Grade TP304L; seamless.

2.1.2.5 Weld materials: Specification Section 05059, Welding - Stainless Steel Liners. For welding stainless steel to stainless steel use E/ER 308L electrodes with a tensile strength of 75,000 psi. For welding carbon steel to stainless use E/ER 309L with a tensile strength of 75,000 psi.

2.1.2.6 Bolts, nuts and washers: See Specification 03252 - Concrete Anchors for Stainless Steel Materials

2.1.3 Hastelloy C-22 Materials

2.1.3.1 Plate: Wrought product comparable to cast alloy per ASTM A494, Grade CX2MW, B/SB-575, HRAP finish, meeting the following chemical composition:

A.	<u>Composition</u>	<u>Min. %</u>	<u>Max. %</u>
	Ni	Balance	
	Cr	21.00	22.40
	Mo	12.90	13.90
	Fe	3.10	4.80
	W	2.60	3.40
	C	----	0.010
	P	----	0.02
	S	----	0.010
	Si	----	0.08
	Co	----	2.5
	Mn	----	0.5
	V	----	0.35

B. Melting practice shall consist of electric arc primary melting, argon/oxygen decarburization treatment, and electroslag remelting into final ingot.

2.1.3.2 Material shall be subjected to corrosion evaluation in accordance with ASTM G28, Practice B. One test shall be conducted per heat of material. The acceptance criteria shall be a measured corrosion rate of less than 0.0008 inches/month. A Certified Material Test Report (CMTR) from the original manufacturer with the above corrosion testing requirement for the actual heat of material is acceptable. Typical CMTRs are not acceptable.

2.1.4 Metal Decking

Metal deck shall be by ASC Pacific, Inc. or approved equal. Deck shall be manufactured from steel conforming to ASTM A446 Grade C, having a minimum yield strength of 40,000 psi, and shall receive a commercial zinc coating (G90) in accordance with ASTM A525.

2.2 FABRICATION AND MANUFACTURE

2.2.1 Shop Detailing

2.2.1.1 Prepare and submit shop and erection drawings for structural steel, metal deck, liner plate and embeds for Buyer's review. Include dimensioning, fabrication and erection details, connection details, methods of field assembly, mark numbers and bills of material. Clearly note field bolting and welding requirements.

2.2.1.2 Each item detailed shall be provided with a unique identifier (mark number) which identifies the structure or building number, the fabricators detail sheet number and an individual piece designation number. Clearly show piece mark numbers on erection drawings.

2.2.1.3 Cut or raw edges shall be rounded off and smooth to the touch.

2.2.1.4 Bends shall have a minimum radius equal to the thickness of the material.

2.2.2 Shop Fabrication - Carbon Steel

2.2.2.1 Do not begin shop fabrication until the shop and erection drawings have been reviewed and released for fabrication by the Buyer.

2.2.2.2 Fabrication of structural steel shall be in accordance with the requirements of the AISC (S302), Sections 6.1 through 6.6, with the modifications and additional requirements specified hereinafter.

2.2.2.3 All fabricated steel shall be indelibly marked with the mark number shown on the shop drawings.

2.2.2.4 Shop welding, including welding qualification, process and preparation, shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners, as applicable for carbon steel.

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Only visual examination of welds, in accordance with procedures specified in Specification Section 05059, is required unless noted otherwise on the Contract Drawings.

2.2.2.5 Steel shall be primed in accordance with Specification Section 09875, Priming of Steel.

2.2.2.6 Prior to priming, all sharp corners, burrs (including bolt hole burrs), weld spatter, slag, weld flux, loose mill scale and other foreign matter shall be removed.

2.2.3 Shop Fabrication - Stainless Steel and Hastelloy C-22

2.2.3.1 Precautions shall be taken to prevent scratching, abrading, nicking and denting during fabrication and handling. Maintain the original surface finish during fabrication, or restore following fabrication to a quality equal to the original finish.

2.2.3.2 The requirements of Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys, shall be followed for handling, fabrication, shipment and storage techniques to minimize the risk of contamination of stainless steel.

2.2.3.3 Do not coat stainless steel and Hastelloy C-22 materials.

2.2.3.4 Make erection marks on fabricated liner plate with vegetable dyes or vibroetching. Painting, chemical etching and die stamping are not acceptable.

2.2.3.5 Shop welding, including welding qualification, process and preparation, shall be in accordance with Specification Section 05059, Welding - Stainless Steel Liners.

2.2.3.6 The stainless steel liner for walls may be installed by the integral method or wallpaper method at the option of the Seller.

2.2.3.7 Determine the extent of shop fabrication and the size of shipping pieces within the requirements indicated in the Contract Drawings.

2.2.3.8 Join liner plate into shipping pieces with complete joint penetration groove welds and clearly note on the shop and erection drawings. Welds shall be ground flush with the plate to a 250-microinch finish.

2.2.3.9 Fabricated liner plate shall be free from warp or twist in excess of 1/4 inch in 10 feet. Inspect fabricated liner plate to verify tolerances.

- 2.2.3.10 Injurious surface defects, such as caused by removal of temporary attachments, arc strikes, mechanical damage, etc., shall be ground to remove the defects. Arc strikes will be allowed on the unexposed side of the liner plate. Grinding shall not reduce the weld or base metal by more than 1/32 of an inch of the specified thickness or 10% of the specified thickness, whichever is less. All surface imperfections, the removal of which will reduce the specified plate thickness to less than that stated above, shall be repaired by welding. Specified thickness is defined as that thickness stated on the Contract Drawings or the specifications. All weld repairs and areas where temporary welds have been made shall be suitably ground, and tested, in accordance with Paragraph 2.2.3.12 of this section.
- 2.2.3.11 Temporary attachments shall be removed flush with the base metal without encroaching on the required minimum wall thickness. Where a surface has been restored by welding, all areas from which attachments have been removed shall be examined in accordance with Paragraph 2.2.3.12 of this section.
- 2.2.3.12 Nondestructive examination (NDE) methods and acceptance criteria of welds and weld repairs shall be performed in accordance with Specification Section 05059, Welding Stainless Steel Liners, as required below:
- A. Liquid penetrant examination shall be performed on cap pass of complete joint penetration groove welds joining liner plate into shipping pieces. Testing shall be performed after all grinding is complete.
 - B. Leak testing (helium mass spectrometer test method) shall be performed on welds which are part of the double containment portion of stainless steel and Hastelloy C-22 sumps.
- 2.2.4 Shop Fabrication - Metal Deck
- Deck units shall be cut to required lengths so that end laps will occur on supporting members. The stainless steel liner shall be attached (welded) to the deck in the factory or shop to the maximum extent practical.
- 2.2.5 Shipping
- 2.2.5.1 Shipping lists shall accompany each shipment of steel.
- 2.2.5.2 Cars and/or trucks shall be loaded and cribbed so they can be readily unloaded. The steel shall be protected from damage caused by shifting of steel during transit.

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- 2.2.5.3 The sizes of fabricated pieces shall be as large as practicable considering clearances and capacities of railroad cars or trucks between the fabricating shop and the jobsite.
- 2.2.5.4 Small pieces shall be bundled with steel bands to prevent damage during shipment and to facilitate unloading.

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Prior to beginning field erection, the Seller shall review the erection drawings, verify receipt of all required materials, and develop an erection plan. The erection plan shall take into account erection loads and provide sufficient temporary bracing to maintain the steel in a safe condition. The temporary bracing shall maintain the steel in a plumb and correctly aligned condition until erection has been completed.
- 3.1.2 Store structural steel members, insert plates, metal deck and liner plates in an area designated by the Buyer, aboveground on platforms, skids or other supports, in such manner that any deformation or damage of shapes, plates, etc., shall be avoided.
- 3.1.3 The requirements of Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys, shall be followed for handling, storage and erection techniques to minimize the risk of contamination of stainless steel and Hastelloy C-22.

3.2 INSTALLATION, APPLICATION AND ERECTION

Erect structural steel in accordance with the requirements of the AISC S302, Section 7, with the modifications and additional requirements specified herein. All steel, decking and liner plates shall be installed in accordance with reviewed shop/detail drawings.

- 3.2.1 Immediately report to the Buyer errors in shop work or errors in existing conditions that are discovered in the field. Do not take corrective action without approval by the Buyer.
- 3.2.2 Field weld components as indicated on the erection drawings. Field weld welded studs in accordance with manufacturer's instructions.

- 3.2.3 All field welding shall be performed in accordance with Specification Section 05059, Welding - Stainless Steel Liners. Welds on the stainless steel liner shall be ground flush with the plate to a 250-microinch finish. Only visual examination of welds, in accordance with procedures specified in Specification Section 05059 is required unless otherwise noted on the Contract Drawings.
- 3.2.4 After erection, inspection and acceptance, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete in accordance with Specification Section 09875, Priming of Steel.
- 3.2.5 Seal weld and grind flush all nail holes in embed plates.
- 3.2.6 General erection tolerances shall be in accordance with AISC S302, Section 7.11 and as indicated on the Contract Drawings.
- 3.2.7 After erection, liner plates shall satisfy a flatness tolerance of 1/4 inch in 10 feet.
- 3.2.8 After erection, inspection and acceptance of the stainless steel liner, the stainless steel surfaces (including sumps, trenches and curbs), shall satisfy the limits for contamination in Specification Section 13252, Precautions for Fabrication, Handling and Storage of Stainless Steel and Nickel Alloys.
- 3.2.9 Injurious surface defects on the exposed face of the liner plate, such as caused by removal of temporary attachment, arc strikes, mechanical damage, etc., shall be ground to remove the defects. Grinding of any face shall not reduce the weld or base metal by more than 1/32 of an inch of the specified thickness or 10% of the specified thickness, whichever is less. All surface imperfections, the removal of which will reduce the specified plate thickness to less than that stated above, shall be repaired by welding. Specified thickness is defined as that thickness stated on Contract Drawings or the specifications. All areas of the exposed face where temporary welds have been made and all weld repairs shall be suitably ground, and tested, in accordance with Section 3.3 of this specification.

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3.2.10 The use of temporary welded attachments during fabrication and erection shall be minimized. All temporary attachment material used for erection shall be compatible with the attached liner material. Temporary attachments on the exposed side shall be removed flush with the base metal by grinding without encroaching on the required minimum wall thickness. Temporary attachments on either side may be knocked off provided that the temporary attachment is the same grade and type of material as the base metal and that the attachment weld is sufficiently small to allow for easy removal with no damage to the base metal. Areas from which temporary attachments have been removed shall be examined in accordance with Section 3.3 of this specification. Temporary attachments on the unexposed side shall be removed when interference with other embedded items occurs.

Temporary attachments on the exposed face of the liner plate shall be removed flush with the base metal without encroaching on the required minimum wall thickness. Where a surface has been restored by welding, all areas from which attachments have been removed shall be examined in accordance with Section 3.3 of this specification.

3.2.11 For metal deck do not remove temporary shoring until concrete has attained the specified compressive strength as determined by the cylinder tests.

3.3 FIELD QUALITY CONTROL

3.3.1 The Seller shall develop quality control program and inspection procedures for the fabrication and erection of the structural steel, insert plates and liner plates to assure conformance with the contract requirements. The Seller's quality control program and inspection procedures shall be submitted in writing to the Buyer for approval. Personnel shall be certified to perform inspection activities. Records of certifications, inspection and certified reports of tests required shall be submitted to the Buyer. The Buyer shall be allowed complete access during fabrication and erection and shall be allowed to inspect all operations including welding and testing.

3.3.2 Nondestructive examination (NDE) methods and acceptance criteria of welds and weld repairs shall be performed in accordance with Specification Section 05059, Welding Stainless Steel Liners, as required below:

3.3.2.1 Liquid penetrant examination shall be performed on all cap pass field welds joining stainless steel liner plates. Testing shall be performed after all grinding is complete.

3.3.2.2 Final leak testing (vacuum box test method) shall be performed on all shop and field welds of the installed stainless steel liner

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system. Any weld areas detected to be leaking shall be corrected and retested.

3.3.2.3 All plates exceeding 2 inches thick shall be checked for lamellar tearing around the areas welded normal to the thickness. Surface cracking shall be checked by visual inspection and subsurface tearing shall be checked by ultrasonic examination for welds exceeding 3/8 inch fillet. Above requirements apply to both shop and field welds.

3.4 ADJUSTMENTS

(Not Used)

3.5 CLEANING

(Not Used)

3.6 PROTECTION

All stainless steel liner plate shall be protected after installation from exposure to sunlight by covering with canvas, tarpaulin, plywood or 5-ply PVC film and nylon yarn laminate, such as Griffolyn T-95FR or equal. Liner shall also be protected from any damage during installation and subsequent work in the lined rooms/areas.

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

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Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

9513336.1221

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

SECTION 05062B
WELDING PIPING
B-595-C-B210A-05062B

APPROVED FOR CONSTRUCTION

REVISION 0 PER CR-0972
ISSUE DATE 7/14/93

WAPA YES ☐ NO ☒
QUALITY LEVEL I ☒ II ☐
SAFETY CLASS 1 ☐ 2 ☒ 3 ☐ 4 ☐

ORIGINATOR:

CHECKER:

A. Estrada 7/8/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 7-8-93
D. A. Buzzelli, Lead Discipline Eng. Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

SECTION 05062B
 WELDING PIPING
 B-595-C-B210A-05062B

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ATTACHMENTS

ATTACHMENT TITLE

A SUMMARY OF HEAT TREATMENT AND NDE REQUIREMENTS FOR WELDED PIPING

**SECTION 05062B
WELDING PIPING**

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, thermal treatment, examination and testing requirements for stainless steel and Hastelloy C-22 piping.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.3 1990 Chemical Plant and Petroleum
Refinery Piping

Boiler and Pressure Vessel Code

ASME Section II, 1989 (Addenda 90) Welding Rods,
Part C Electrodes, and Filler Metals

ASME Section V 1989 Nondestructive Examination

ASME Section IX 1989 (Addenda 90) Welding and
Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A 1988 Recommended Practice -
Personnel Qualification and
Certification in Nondestructive
Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 1986 Standard Symbols for Welding,
Brazing and Nondestructive
Examination

AWS A3.0 1989 Welding Terms and Definitions
Including Terms for Brazing,
Soldering, Thermal Spraying and
Thermal Cutting

AWS D10.11 1987 Recommended Practice for Root
Pass Welding of Pipe without Backing

AWS QC1 1988 Standard and Guide for
Qualification and Certification of
Welding Inspectors

1.3 RELATED REQUIREMENTS

Specification Section 13252 Precautions for Fabrication,
Handling and Storage of
Stainless Steel and Nickel
Alloys

1.4 DEFINITIONS

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 SYSTEM DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and
Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications (ASME Form QW-482 or equivalent)
and Procedure Qualification Records (ASME Form QW-483 or
equivalent) shall be submitted for Buyer approval. This
requirement shall also pertain to purchased items contracted by
Seller. They shall be in accordance both with ASME Section IX and
this specification section. Seller shall review the contractor's
procedures prior to submittal to Buyer to verify their conformance
to the requirements of this specification section.

1.6.2 Welder Performance Qualifications (ASME form QW-484 or equivalent)
shall be submitted for Buyer review. This requirement shall also
pertain to purchased items contracted by Seller.

1.6.3 Repair procedures for welds shall be submitted for Buyer approval.
The procedure shall list the repair steps, examination methods and
welding procedure specification used during weld repair.

1.6.4 Final weld nondestructive examination (NDE) and inspection reports
shall be submitted for Buyer review. These shall include visual
inspection reports and radiographic film.

- 1.6.5 Attachment A summarizing application of individual welding procedures with regards to types of joints and piping material line classes shall be submitted for Buyer approval. Welding shall not begin until these documents are returned to Seller with authorization to proceed.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Weld filler materials shall be in accordance with ASME Section II, Part C.

- 2.1.2 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal.

- 2.1.3 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux is not acceptable.

- 2.1.4 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.

- 2.1.5 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of ASME Section II, Part C and the filler metal manufacturer's recommendations. Hastelloy C-22 SMAW electrode shall be stored in an electrode oven before use. Oven temperature shall be between 300°F and 400°F, inclusive.

- 2.1.6 Submerged arc welding shall be performed using both the same name brand flux and the same name brand of ASME classification wire as used for the procedure qualifications.

- 2.1.7 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.

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- 2.1.8 A minimum of 2 passes are required on all socket weld connections.
- 2.1.9 For dissimilar joints in base material consisting of stainless steel on one side and Hastelloy C-22 on the other, the filler metal shall meet the requirements of ASME classifications ENiCrMo-10 and ERNiCrMo-10.
- 2.2 **FABRICATION AND MANUFACTURE**
 - 2.2.1 General Requirements
 - 2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of ASME B31.3. Conformance to this specification section and authorization of Welding Procedure Specifications and Procedure Qualification Records shall in no way relieve Seller of the responsibility to provide welds which are sound and suited to the services for which they are intended.
 - 2.2.1.2 Welding and nondestructive test symbols shall be in accordance with AWS A2.4.
 - 2.2.1.3 Welding terms and definitions shall be in accordance with AWS A3.0.
 - 2.2.1.4 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.
 - 2.2.1.5 Peening of welds is not permitted.
 - 2.2.1.6 All weld spatter, burrs, etc. shall be removed/ground out in their entirety and blended smoothly with the pipe surface.
 - 2.2.1.7 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/16 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/16 inch shall be ground to a smooth contour.
 - 2.2.1.8 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the pipe surface. The remaining material shall then be ground flush with the base metal. Grinding shall not reduce the pipe wall thickness below 0.875 times the nominal wall thickness. The ground area shall be inspected for cracks or porosity by liquid penetrant examination. Liquid penetrant examination shall be in accordance with Paragraph 3.2.4.
 - 2.2.1.9 Nozzles, lugs, support rings and similar items shall not be located on a weld seam unless unavoidable. Buyer authorization shall be required if any attachment is to be located on weld seam.

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- 2.2.1.10 Attachment A of this specification section summarizes heat treatment, inspection and nondestructive examination requirements for shop and field welds.
- 2.2.1.11 All butt joint welds shall be full penetration. This includes secondary containment portion of double-jacketed piping.
- 2.2.1.12 Piping root pass welds shall be made by the GTAW process with filler metal added. Fill passes and cap pass welds can be deposited by any of the processes listed in Paragraph 2.2.3. The root pass on said welds shall be made with back-purging gas. The purge shall be maintained until not less than .250 inch of weld metal has been deposited or the weld joint is filled, whichever is less. Purging shall be in accordance with AWS D10.11.
- 2.2.1.13 GTAW process for circumferential butt joint welds without filler metal (autogenous welding) may be acceptable provided the Seller submits all pertinent technical information and receives authorization. Welds shall be made using an automatic orbital welder.
- 2.2.2 Welding Qualifications
 - 2.2.2.1 Welding Procedure Specifications, Procedure Qualification Records and Welder Performance Qualifications shall be in accordance with ASME B31.3. They shall also be in accordance with this specification section.
 - 2.2.2.2 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.
 - 2.2.2.3 When consumable inserts are used for stainless steel and Hastelloy C-22 butt joints, the welding procedure must be qualified with an insert.
 - 2.2.2.4 Tack welds shall be made by qualified welders. Approved Welding Procedure Specifications shall be used.
- 2.2.3 Acceptable Welding Processes
 - 2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:

Welding Process

AWS Letter Designation

Shielded Metal Arc Welding

SMAW

Manual and Automatic Gas
Tungsten Arc Welding

GTAW

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Automatic Submerged Arc Welding

SAW

- 2.2.3.2 Other welding processes such as Gas Metal Arc or Semi-Automatic Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.
- 2.2.3.3 SAW welding process shall not be used on Hastelloy C-22.

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal or plasma cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel thermal cutting shall not be used for joint preparation of stainless steel and Hastelloy C-22.
- 3.1.2 Permanent backup strips or backing rings are not permitted without specific written authorization from Buyer. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of the area shall be performed both visually and by liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.4.
- 3.1.3 Where specific details of fabrication are not shown on the Contract Documents, fabrication shall be in accordance with ASME B31.3.
- 3.1.4 When branch reinforcement is required, it shall be shown on design drawings. Welding shall be in accordance with ASME B31.3.
- 3.1.5 To minimize the contamination of stainless steel and Hastelloy C-22, Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.6 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.7 Joint edges and adjacent surfaces to be welded shall be wire brushed. They shall then be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.8 Wire brushes shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel and Hastelloy C-22 such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel and nickel alloys only.

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3.1.9 Grinding shall be done in such a method that overheating of stainless steel base metal and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.

3.1.10 For Hastelloy C-22, an area one inch wide minimum on each side of the weld joint shall be ground to bright metal prior to welding. An 80 grit abrasive wheel shall be used to perform this grinding.

3.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.

3.2 INSTALLATION, APPLICATION and ERECTION

3.2.1 All welds shall be made in accordance both with Contract Documents and Seller's fabrication drawings.

3.2.2 Flux, weld spatter and any slag shall be removed from each weld bead prior to depositing each succeeding pass.

3.2.3 Thermal Treatment

3.2.3.1 Minimum mandatory preheating temperatures for thermal cutting, tack welding and welding shall be in accordance both with ASME B31.3, Table 330.1.1 and Attachment A. The minimum preheat temperature shall be sufficient to remove all moisture prior to welding.

3.2.3.2 Interpass temperature for stainless steel shall not exceed 350°F. Do not strike an arc when the point to be welded is at a temperature of 350°F or above.

3.2.3.3 Interpass temperature for Hastelloy C-22 shall not exceed 200°F. Do not strike an arc when the point to be welded is at a temperature of 200°F or above.

3.2.4 Inspection and Nondestructive Examination

3.2.4.1 General Requirement

Specific nondestructive examination (NDE) requirements for each material and piping line class shall be as noted in Attachment A. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

A. Buyer may witness any or all examinations with final authority on all NDE interpretation results.

3.2.4.2 Inspection

- A. Seller's welding inspector for visual examination shall be qualified and certified in accordance with AWS QC1 or equal that has been authorized by Buyer.
- B. All weld inspection reports shall be maintained and submitted in accordance with Paragraph 1.6.

3.2.4.3 Visual Examination

- A. Visual examination shall be performed in accordance both with ASME B31.3, Paragraph 344.2 and this specification section.
- B. Visual examination shall be performed on accessible surface of all completed welds.
- C. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

3.2.4.4 Liquid Penetrant Examination

- A. Liquid penetrant examination shall be in accordance with ASME Section V, Article 6. Solvent-removable penetrant shall be used.
- B. Penetrant materials shall be in accordance with ASME Section V, Article 6, Paragraph T-625 for sulfur and halogen content regardless of the type of material to be examined.
- C. Liquid penetrant examination of welds shall include a band of base metal no less than 1 inch wide on each side of the weld.
- D. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2.

3.2.4.5 Ultrasonic Examination

- A. Ultrasonic examination procedures shall be in accordance both with ASME Section V, Article 5 and ASME B31.3, Paragraph 344.6.2.
- B. The evaluation of indications and acceptance criteria shall be in accordance with ASME B31.3, Paragraph 344.6.2.

3.2.4.6 Radiographic Examination

- A. Radiographic examination procedures and techniques shall be in accordance with ASME B31.3, Paragraph 344.5.

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- B. The acceptance criteria shall be in accordance with ASME B31.3, Paragraph 341.3.2 and Table 341.3.2A, as applicable.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

- 3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedure.

- 3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined by the liquid penetrant method to assure complete removal of defects. Liquid penetrant examination shall be in accordance with Paragraph 3.2.4.

- 3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

- 3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of Buyer.

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION

ATTACHMENT A
SUMMARY OF HEAT TREATMENT AND NDE
REQUIREMENTS FOR WELDED PIPING

1. For stainless steel: Preheat base metal to 50 °F for all thicknesses. Maximum interpass temperature shall not exceed 350 °F. For Hastelloy C-22: Preheat base metal to 50 °F for all thicknesses. Maximum interpass temperature shall not exceed 200 °F.
2. Nondestructive examination and acceptance criteria for radiography shall be in accordance with ASME B31.3, Paragraph 341.4, for Normal Fluid Service. These requirement pertain to carrier and containment piping.

Exceptions: 1. 100% of carrier piping girth and miter groove butt joint welds shall be radiographed.

2. Longitudinal welds of split containment fittings and split piping require 5% random radiography or ultrasonic examination. Welds shall be selected from each welder's production of like material and welding process regardless of line class. The acceptance criteria shall be as specified for girth and miter groove welds in ASME B31.3, Table 341.3.2A.

3. Visual examination and acceptance criteria for carrier and containment piping shall be in accordance with ASME B31.3, Paragraph 341.4, for Normal Fluid Service.

Exceptions: 1. 100% of butt joint welds shall be visually examined.

2. 100% of erection of piping and erected piping shall be visually examined in accordance with ASME B31.3, Paragraphs 341.4.1.a.5 and 341.4.1.a.6.

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Client: DEPARTMENT OF ENERGY
 Plant: HANFORD WASTE VITRIFICATION PLANT
 Location: RICHLAND, WASHINGTON

SUMMARY OF HEAT TREATMENT AND NDE REQUIREMENTS FOR WELDED PIPING

R E V I S I O N	L I N E C L A S S	Carrier Pipe Material And P-Number	Containment Pipe Material And P-Number	PREHEAT AND INTERPASS TEMPERATURE (see previous page for explanation of notes appearing below)					INSPECTION AND NON-DESTRUCTIVE EXAMINATION (see previous page for explanation of notes appearing below)					WELDING PROCEDURE SPECIFICATION(S)
				B U T T A N D	F I L L E T W E L D S	S O L D E T W E L D S	S E A L W E L D S	N O N T A C H M E N T S	B E N D S	R A D I O G R A P H Y (RT)	U L T R A S O N I C (UT)	M A G N E T I C (MT)	P A R T I C L E (PT)	L P I Q U E I T D R A N T (VT)
	DF	Hast. C-22 P-45	304L SS P-8	1	1	1	--	2	--	--	--	--	3	

*Blank Denotes Basic Code Requirements

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Richland, Washington
DOE Contract DE-AC06-86RL10838

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SECTION 05059
WELDING - STAINLESS STEEL LINERS
B-595-C-B210A-05059

APPROVED FOR CONSTRUCTION

REVISION 1 PER CR-0972
ISSUE DATE 7/14/93

WAPA	YES	<u> </u>	NO	<u>X</u>
QUALITY LEVEL	I	<u>X</u>	II	<u> </u>
SAFETY CLASS	1	<u> </u>	2	<u> </u>
	3	<u>X</u>	4	<u> </u>

ORIGINATOR(S):

CHECKER(S):

A. Estrada 7/8/93
A. Estrada, Welding Engineer Date

D. A. Buzzelli 7-8-93
D. A. Buzzelli, Lead Discipline Engr. Date

APPROVED BY:

R. B. Erickson
R. B. Erickson Deputy Lead Discipline Engineer

7-8-93
Date

JUL 15 1993

SECTION 05059
 WELDING - STAINLESS STEEL LINERS
 B-595-C-B210A-05059

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SECTION 05059
WELDING - STAINLESS STEEL LINERS

PART 1 GENERAL

1.1 SUMMARY

This specification section defines the welding, examination and testing requirements for fabrication of stainless steel embeds, carbon steel embeds, stainless steel liner plates, stainless steel sumps and Hastelloy C-22 sumps.

1.2 REFERENCES

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Boiler and Pressure Vessel Code

ASME Section V	1989 Nondestructive Examination
ASME Section VIII, Division 1	1989 Rules for Construction of Pressure Vessels
ASME Section IX	1989 (Addenda 90) Welding and Brazing Qualification

AMERICAN SOCIETY OF NONDESTRUCTIVE TESTING (ASNT)

ASNT SNT-TC-1A	1988 Recommended Practice - Personnel Qualification and Certification in Nondestructive Testing
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	1990 Structural Welding Code
AWS D9.1	1990 Sheet Metal Welding Code
AWS D10.11	1987 Recommended Practice for Root Pass Welding of Pipe Without Backing

1.3 RELATED REQUIREMENTS

Specification Section 09875	Priming of Steel
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Specification Section 13252 Precautions for Fabrication,
Handling and Storage of Stainless
Steel and Nickel Alloys

1.4 DEFINITIONS

CMTR - Certified Material Test Report

NDE - Nondestructive Examination

1.5 SYSTEMS DESCRIPTION

(Not Used)

1.6 SUBMITTALS

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Welding Procedure Specifications and Procedure Qualification Records shall be submitted for Buyer approval. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with AWS D1.1 or ASME Section IX and this specification section. Seller shall review the contractor's procedures to verify their conformance to the requirements of this specification section.

1.6.2 Welder Performance Qualifications shall be submitted for Buyer review. This requirement shall also pertain to purchased items contracted by Seller. They shall be in accordance both with AWS D1.1 or ASME Section IX and this specification section.

1.6.3 Certified Material Test Reports (CMTRs) for filler material shall be submitted for Buyer review.

1.6.4 Weld repair procedures shall be submitted for Buyer approval.

1.6.5 Final weld nondestructive examination (NDE) and inspection reports shall be submitted for Buyer review. These shall include visual inspection reports and radiographic film.

1.7 CLASSIFICATION OF SYSTEMS AND COMPONENTS

(Not Used)

1.8 PROJECT OR SITE ENVIRONMENTAL CONDITIONS

(Not Used)

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PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- 2.1.1 Matching weld filler materials shall be in accordance with AWS D1.1, Table 4.1 or AWS D9.1, Appendix A.
- 2.1.2 For welding carbon steel a minimum 70 ksi weld filler metal shall be used.
- 2.1.3 Weld filler materials shall be used so that the principal elements in the deposited weld metal shall be of the same nominal composition as the base metal (Example: for Type 304L stainless steel, use AWS classification E/ER 308L filler material).
- 2.1.4 Solid wires for automatic welding processes shall contain the principal alloying elements required for the deposited weld metal. Welds deposited by the submerged arc process shall not derive any principal alloying elements from the flux. Alloy flux is not acceptable.
- 2.1.5 Fluxes that the flux manufacturer recommends for single-pass shall not be used for multiple-pass welds.
- 2.1.6 Submerged arc welding shall be performed using the same name brand flux and the same name brand of AWS classification wire as used for the procedure qualifications.
- 2.1.7 Storage and handling of electrodes, fluxes and other welding material after shipping containers are opened shall be in accordance with Seller's filler materials control procedure. This procedure shall follow the guidelines of AWS D1.1, AWS D9.1 and the filler metal manufacturer's recommendations. Hastelloy C-22 SMAW electrode shall be stored in an electrode oven before use. Oven temperature shall be between 300°F and 400°F, inclusive.
- 2.1.8 Tack welds shall be made with the equivalent type of filler wire that is used for the root pass.
- 2.1.9 Temporary backup rings or strips, when required on the Contract Documents, shall be of the same nominal composition as the base material.
- 2.1.10 For dissimilar joints in base materials consisting of carbon steel on one side and austenitic stainless steel on the other, the filler metal shall be AWS classification E/ER 309L.
- 2.1.11 Use AWS classification E/ER 309L for all weld passes when joint detail indicates that stainless steel liner is being welded to carbon steel embed.

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- 2.1.12 For welding Hastelloy C-22 to itself and to stainless steel, use AWS classification ERNiCrMo-10 or ENiCrMo-10 filler metal.
- 2.2 FABRICATION AND MANUFACTURE
 - 2.2.1 General Requirements
 - 2.2.1.1 Fabrication to this specification section shall be in accordance with the requirements of AWS D1.1, Section 8.
 - 2.2.1.2 Cleanliness shall be maintained during welding. All stubs, rods, flux, slag and other foreign material shall be removed from the weld area.
 - 2.2.1.3 All weld spatter, burrs, etc. shall be ground to a smooth contour.
 - 2.2.1.4 Arc strikes, weld starts and stops shall be confined to the weld joint. Arc strikes found outside the weld joint that are deeper than 1/32 inch shall be welded to fill depression and then ground to a smooth contour. Those less than 1/32 inch shall be ground to a smooth contour.
 - 2.2.1.5 Fabrication aids, temporary supporting lugs, etc., that are removed by gouging or cutting shall not be cut closer than 1/8 inch from the base metal surface. The remaining metal shall then be ground flush with the base metal surface. The ground area shall be inspected for cracks or porosity either by liquid penetrant or magnetic particle examination, whichever is applicable. Liquid penetrant and magnetic particle examination shall be in accordance with Paragraph 3.2.9.
 - 2.2.1.6 Seller shall recognize the occurrence of lamellar tearing in highly-restrained joints in carbon steel welded structures. Seller shall take precautions to eliminate this occurrence through fabrication techniques.
 - 2.2.1.7 Welding of galvanized carbon steel to stainless steel is not acceptable.
 - 2.2.2 Welding Qualifications
 - 2.2.2.1 Welding procedures, welders, welding operators and tackers shall be qualified in accordance either with AWS D1.1 or ASME Section IX where applicable. ASME Section IX, Welder Performance Qualification, may be used in lieu of AWS D1.1 qualifications.
 - 2.2.2.2 Qualification of shear stud bases shall be in accordance with AWS D1.1, Section 7.

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- 2.2.2.3 At the request of the Buyer, any welder shall be retested and recertified when the work of said welder creates a reasonable doubt as to the quality of his/her workmanship.
- 2.2.2.4 The format of welding procedure specifications including prequalified welding procedures, welding procedure qualification records and nondestructive inspection reports shall be in accordance with AWS D1.1, Appendix E or ASME Section IX, Appendix A or equivalent.
- 2.2.2.5 Welding shall not start until Welding Procedure Specifications, Procedure Qualification Records and Weld Repair Procedure are returned to the Seller from the Buyer with authorization to proceed. Welding performed by procedures differing from those authorized or personnel not qualified are subject to complete removal.
- 2.2.2.6 Welding Procedures Specification and Procedure Qualification Records for welding galvanized carbon steel qualifies the procedure for welding plain carbon steel, but not vice versa.
- 2.2.3 Acceptable Welding Processes
- 2.2.3.1 Welding may be achieved by any one or combination of the following welding processes:
- | <u>Welding Process</u> | <u>AWS Letter Designation</u> |
|-----------------------------------------------|-------------------------------|
| Shielded Metal Arc Welding | SMAW |
| Flux-Cored Arc Welding (with shielding gas) | FCAW |
| Shear Stud Welding | SW |
| Automatic Submerged Arc Welding | SAW |
| Manual and Automatic Gas Tungsten Arc Welding | GTAW |
- 2.2.3.2 Other welding processes such as Gas Metal Arc or Manual Submerged Arc require specific written authorization by the Buyer. Submit all pertinent data and intended application of said process for evaluation.
- 2.2.3.3 FCAW and SAW processes are not permitted on Hastelloy C-22.

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PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Weld joint preparation shall be made by machining, grinding or thermal cutting. When thermal cutting is performed the joint surfaces shall be ground to bright metal prior to welding. Oxy-fuel cutting shall not be used for joint preparation of stainless steel and Hastelloy C-22.
- 3.1.2 For structural tubular welds, longitudinal weld seams shall be parallel to the longitudinal axis and shall be complete (100 percent) penetration butt welds. Longitudinal seams of adjoining tubular members shall not be in line but shall be offset from other longitudinal seams by at least five (5) times the wall thickness of the tubular component.
- 3.1.3 Permanent backup strips or backing rings are not permitted without specific written authorization from the Buyer. Embeds are not considered backup strips. If temporary backup strips are used and then removed, the weld area shall be dressed and examined for cracks and other defects. Examination of area shall be performed visually and by either magnetic particle or liquid penetrant method. Examination shall be in accordance with Paragraph 3.2.9.
- 3.1.4 The parts to be joined shall be in accordance with the assembly requirements of AWS D1.1, Section 3.3.
- 3.1.5 To minimize the contamination of austenitic stainless steel and Hastelloy C-22, Seller shall follow the requirements of Specification Section 13252 prior to and after welding.
- 3.1.6 All surfaces to be welded shall be free of paint, oil, dirt, scale, oxides and other foreign materials detrimental to weld soundness.
- 3.1.7 For stainless steel, joint edges and adjacent surfaces to be welded shall be wire brushed. They shall be cleaned with an ethyl alcohol or acetone dampened lint-free cloth before welding begins.
- 3.1.8 Wire brushes used on stainless steel and Hastelloy C-22 welds shall be made of 300 series austenitic stainless steel. Mechanical cleaning tools used on stainless steel and Hastelloy C-22 such as grinding wheels, files, deburring tools and wire brushes shall be clearly marked. Marking shall identify tools to be used on stainless steel and Hastelloy C-22 only.

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- 3.1.9 Grinding shall be done in such a method that overheating of stainless steel base metal and weld metal is minimized. Heat tint is an indication of overheating. Abrasive disks and abrasive flapper wheels are preferred over grinding disk or continuous-belt grinders.
- 3.1.10 For double-wall containment portion of sumps where double-welded butt joints cannot be utilized, the root pass welds shall be made with the GTAW process. Back-purging gas shall be used during welding. The purge shall be maintained until at least 0.250 inch depth of weld metal has been deposited or the weld joint is filled, whichever is less. Back-purging shall be in accordance with AWS D10.11.
- 3.1.11 Tack welds in open butt joints shall be feathered into surrounding material. Cracked tack welds shall be removed.
- 3.1.12 For Hastelloy C-22, an area one inch wide on each side of weld joint shall be ground to bright metal with 80 grit abrasive disk prior to welding.
- 3.1.13 For Hastelloy C-22, the design of weld joint shall take into consideration the low fluidity and low penetration characteristics inherent in nickel alloys.
- 3.1.14 Where double-welded joints are utilized for full-penetration welds, the backside of the root pass shall be ground to bright metal prior to depositing weld from the backside.
- 3.1.15 Galvanized surfaces that are welded shall be prepared and primed in accordance with Specification Section 09875.
- 3.2 **INSTALLATION, APPLICATION AND ERECTION**
 - 3.2.1 All welds shall be made in accordance both with Contract Drawings and Seller's fabrication drawings.
 - 3.2.2 All plug and butt welds on liner plates shall be ground smooth and flush with the base metal for ease of decontamination.
 - 3.2.3 Where the embed joint detail indicates 2t root opening (t = base metal thickness), the first welds deposited shall be fillet welds fusing the carbon steel embed to the stainless steel liner plates.
 - 3.2.4 Welding starts and stops in welds shall be held to a minimum. Each such stop shall be ground to eliminate crater cracks before continuing the weld. The use of starting and stopping plates is recommended where possible.
 - 3.2.5 Plug welds and square edge butt joints shall have a minimum of 3 passes when welded to carbon steel embeds.

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3.2.6 To prevent oxidation on Hastelloy C-22 filler metal during the GTAW process, the filler metal tip shall remain in the shielding gas until the weld is complete or the tip is allowed to cool. If the tip is oxidized, the oxidized portion shall be cut off before welding is resumed.

3.2.7 Preheat and Interpass Temperature Control

3.2.7.1 The minimum preheat and interpass temperature requirements for carbon steel shall be in accordance with AWS D1.1, Paragraphs 4.2 and 4.3.

3.2.7.2 The minimum preheat for stainless steel shall be 50°F. Interpass temperature shall not exceed 350°F.

3.2.7.3 The minimum preheat for Hastelloy C-22 shall be 50°F. Interpass temperature shall not exceed 350°F.

3.2.8 Stress Relief Heat Treatment

3.2.8.1 When required by Contract Documents, welded assemblies shall be stress-relieved by heat treating.

3.2.8.2 Stress relief for purposes of dimensional stability is not acceptable for ganged embeds with PUREX nozzles.

3.2.8.3 Stress relief heat treatment shall be in accordance with AWS D1.1, Section 4.4. Exception: alternate stress relief times and temperatures permitted by Table 4.5 shall not be used.

3.2.8.4 All required finish machining shall be done after heat treatment.

3.2.9 Inspection and Nondestructive Examination

Specific nondestructive examination (NDE) shall be performed in accordance both with Contract Documents and Seller's fabrication drawings. NDE methods, acceptance criteria and additional general requirements shall be in accordance with the following subparagraphs. All NDE, except visual examination, shall be performed by personnel certified in accordance with ASNT SNT-TC-1A.

3.2.9.1 Inspection

A. The welding inspector for visual examination shall be qualified and certified in accordance with AWS D1.1, Paragraph 6.1.3.

B. All weld inspection reports shall be submitted in accordance with Paragraph 1.6.

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3.2.9.2 Visual Examination

- A. Visual examination shall be performed in accordance with AWS D1.1, Section 6.
- B. Seller shall visually inspect all completed welds in accordance with AWS D1.1, Section 8.15.1. Weld profiles shall be in accordance with Figure 3.4 of AWS D1.1. Defective welds shall be repaired in accordance with Seller's approved weld repair procedures.
- C. In addition to visual examination of the completed weld, visual examination is required for all ground and blended welds.
- D. For butt joints, the weld metal on the front surface shall in no place be lower than the adjacent base metal surfaces.
- E. Plug and groove welds shall have a uniform transition from the joined material into the weld deposit. They shall be free of undercut and unfused overlap of the weld deposit.
- F. Fillet weld surfaces shall have a uniform transition from the base material into the weld deposit. They shall be free of undercut and unfused overlap.
- G. For fillet welds, sizes indicated on weld symbols are minimum sizes.

3.2.9.3 Liquid Penetrant Examination (Structural Steel Embeds)

Liquid penetrant examination shall be in accordance with AWS D1.1, Section 6.7.7, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.5.

3.2.9.4 Liquid Penetrant Examination (Austenitic Stainless Steel Liner Plates)

- A. Liquid penetrant examination shall be in accordance with ASME Section V, Article 6 when required by the Contract Documents. Acceptance criteria shall be in accordance with ASME Section VIII, Division 1, Appendix 8, Paragraphs 8.3 and 8.4. Exception: maximum round indication shall not exceed 1/16 inch.
- B. Liquid penetrant examination shall be performed after welds have been ground and visually examined. Examination shall include a band of base metal no less than 1 inch on each side of the weld.

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- C. Penetrant material shall be in accordance with ASME Section V, Article 6, T-625 for sulfur and halogen content.

3.2.9.5 Magnetic Particle Examination

Magnetic particle examination shall be in accordance with AWS D1.1, Section 6.7.6, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.5.

3.2.9.6 Ultrasonic Examination

Ultrasonic examination shall be in accordance with AWS D1.1, Chapter 6, Part C, when required by the Contract Documents. Acceptance criteria shall be in accordance with AWS D1.1, Section 8.15.4.

3.2.9.7 Leak Testing

- A. When required by the Contract Documents, the helium mass spectrometer test detector probe technique method shall be performed in accordance with ASME Section V, Article 10, Appendix IV. Acceptance criteria shall be in accordance with Paragraph IV-1050. The maximum helium gas pressure shall not exceed 5 psig.
- B. When required by the Contract Documents, the vacuum box test method shall be performed in accordance with ASME Section V, Article 10, Appendix II. Acceptance criteria shall be in accordance with Paragraph II-1050.

3.3 FIELD QUALITY CONTROL

(Not Used)

3.4 ADJUSTMENTS

3.4.1 Weld Repairs

- 3.4.1.1 All weld repairs shall be performed in accordance with the approved weld repair procedures.
- 3.4.1.2 Unacceptable indications shall be completely removed by chipping, gouging, grinding or other authorized methods (for the type of material being repaired) to clean, bright metal. The excavated areas shall then be examined either by the magnetic particle or liquid penetrant method to assure complete removal of defects. Magnetic particle or liquid penetrant examination shall be in accordance with Paragraph 3.2.9.

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3.4.1.3 The repaired areas shall be reexamined using the same inspection procedures by which the defect was originally detected, along with all other inspection called out for the particular weld.

3.4.1.4 Two repair attempts will be allowed on any one defective area. No further repair attempts shall be carried out without the authorization of the Buyer.

3.5 CLEANING

(Not Used)

3.6 PROTECTION

(Not Used)

3.7 DEMONSTRATION

(Not Used)

3.8 SCHEDULES

(Not Used)

END OF SECTION